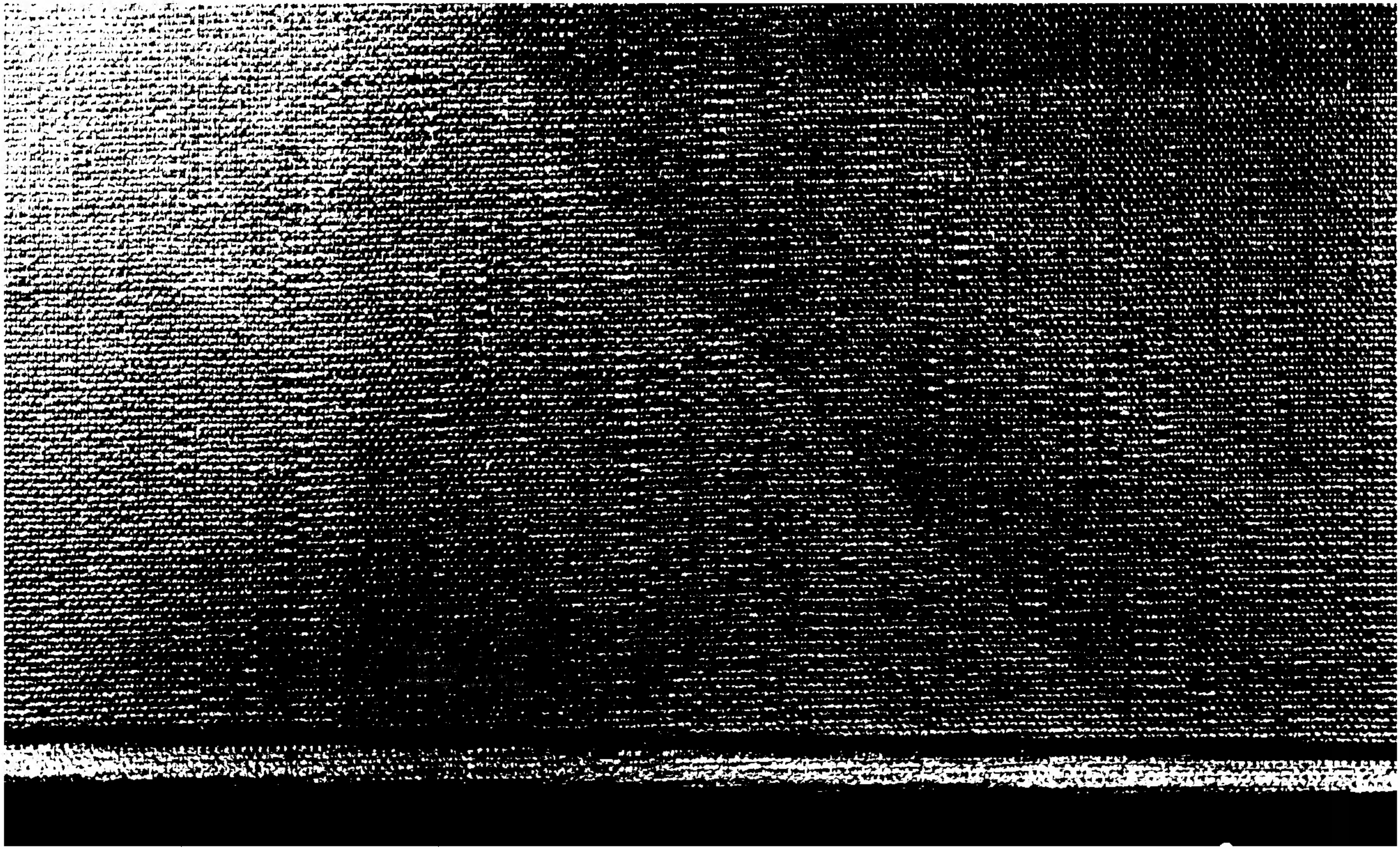

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OF

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EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

VOLUME IX

WITH 12 PLATES AND 39 FIGURES

1908

PUBLISHED FOR THE GARDEN

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The New York Botanical Garden

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THE COLLECTIONS OF FUNGI.

The fungus collections of the garden are arranged in two series, one in the museum of systematic botany on the second floor of the museum building, and the other in the mycological herbarium room on the floor above. The former is for the benefit of the general public, the latter for the use of students only.

The public museum collection, consisting at present of about 700 separate exhibits, is installed in 20 cases and 50 swinging frames, arranged in five blocks each, as shown in the accompanying plan (Fig. 1). Specimens are mounted on blocks or cardboard or in frames, or are preserved in alcohol or formalin. Photographs and colored drawings form an important part of the collection. Two cases, with 70 exhibits, are devoted to the smuts and rusts; and two cases, with 45 exhibits illustrate the coral-fungi, the hedgehog-fungi, and closely related groups. The large and conspicuous polypores fill six cases, with 185 exhibits; while the gill-fungi, very perishable plants, occupy at present only one case, with 55 exhibits. Many colored drawings of agarics, however, are now being mounted in the swinging frames. The puffballs are well represented in a separate case by 45 exhibits. The chestnut disease so prevalent about New York is also exhibited in a single case. Four cases are devoted to the lichens, with 120 exhibits; and the sac-fungi and imperfect forms, with over 100 exhibits, are shown in the remaining three cases.

The study collection of these plants, consisting of about 160,000 specimens, has been recently removed to a large room over

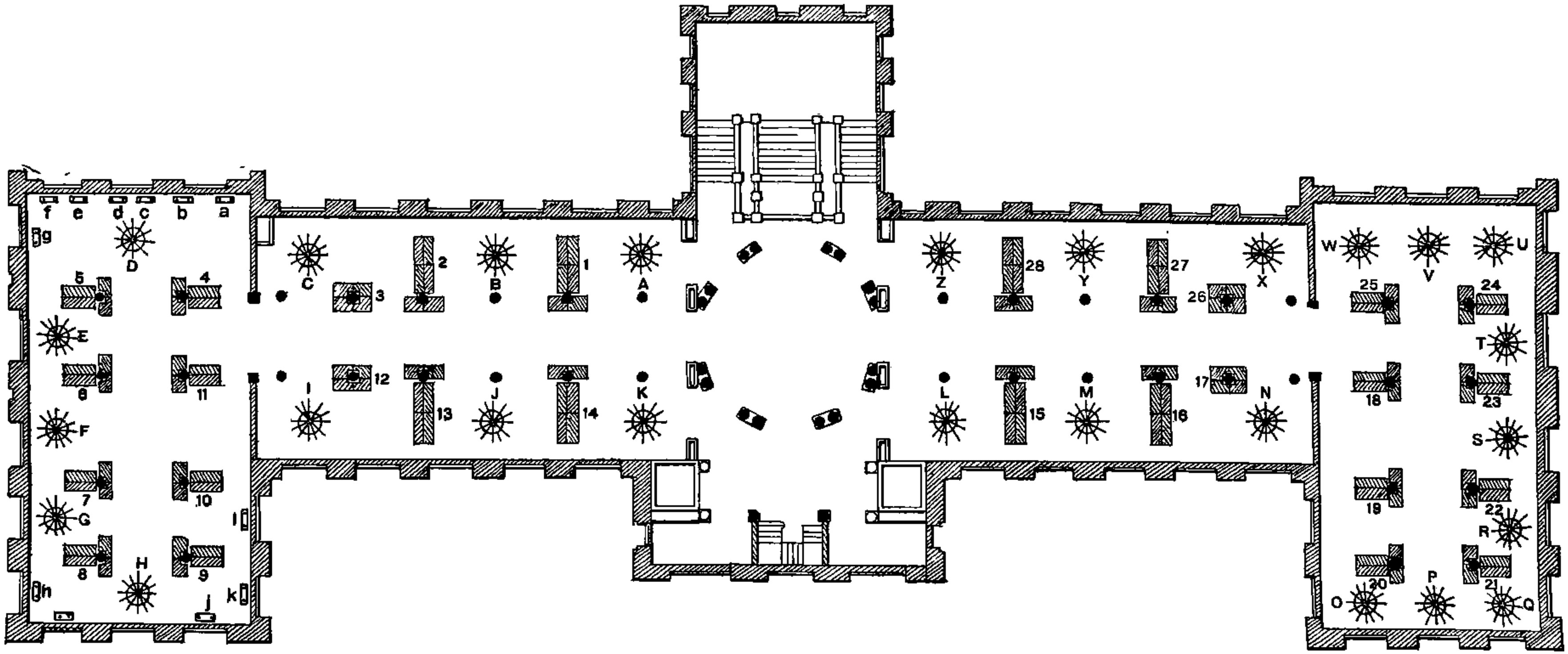

FIG. 1. Floor-plan of the museum of systematic botany. Blocks of cases 4 to 8 and swinging frames *D* to *H*, occupying most of the west wing, are devoted to the fungus exhibits.

forty feet long and nearly thirty feet wide at the northwestern corner of the building, where thirty new herbarium cases have been installed to receive it.

A general idea of the arrangement of the herbarium may be gained from the accompanying plan. The six central blocks of four cases each contain the regular groups of fungi in series, ten cases being devoted to moulds, sac-fungi and imperfect forms, two to smuts and rusts, and twelve to the higher groups. The side cases contain the synoptical collection, duplicates, and miscellaneous specimens. At one end of the room are desks and

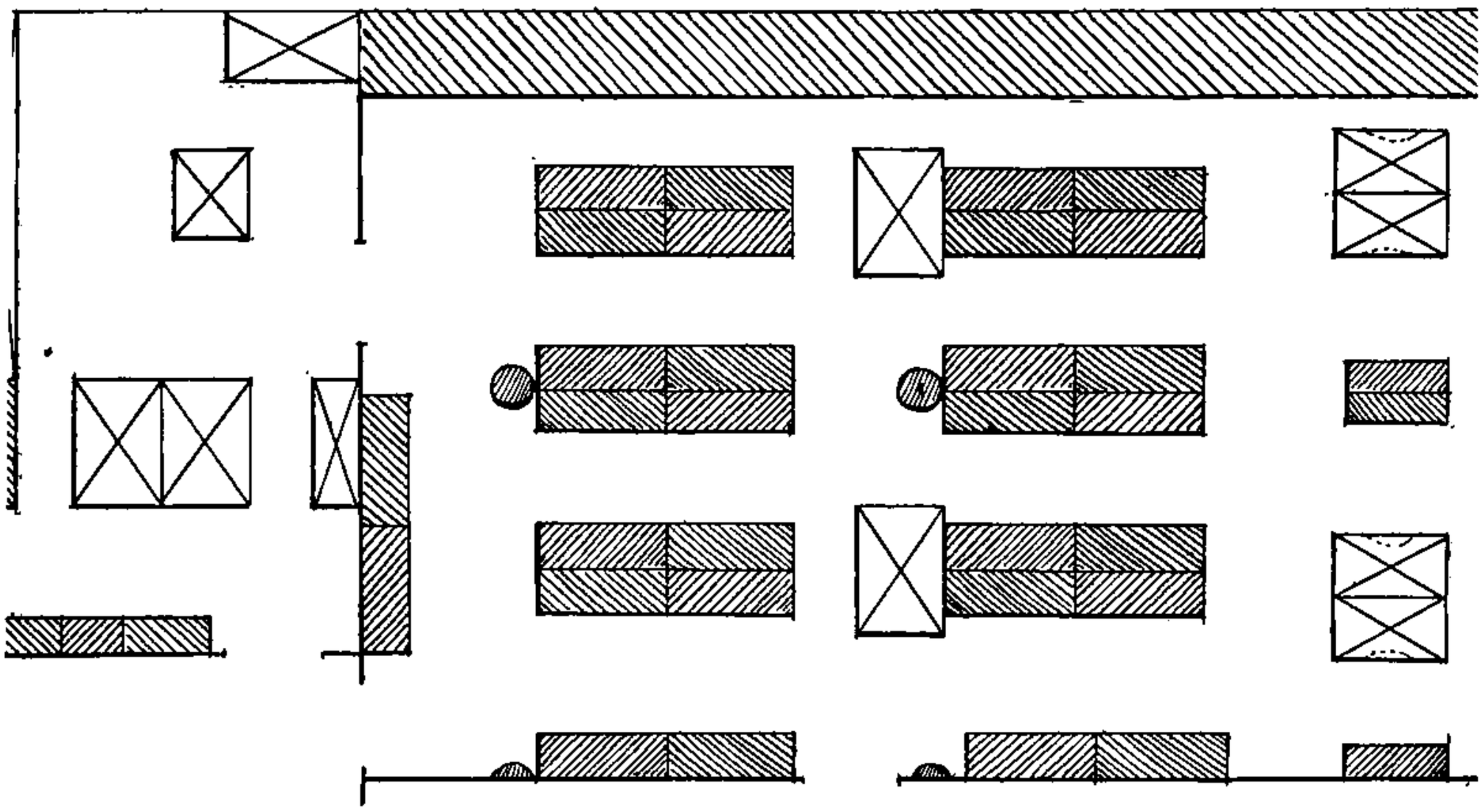

FIG. 2. Plan of the Mycological Herbarium.

other equipment for the use of students, and in the center large tables for laying out specimens. At the other end is the office of the curator in charge of the fungi.

The original Ellis collection of 80,000 specimens was purchased in 1896, and his residual collection of 20,000 specimens in 1900. Since that time the Garden has obtained an average of over 8,000 specimens a year, making a total of 60,000 acquired in the past seven years.

Mr. Ellis was at work upon his collection for forty years, during which time he not only collected extensively himself, but

received material from all parts of this country and many parts of Europe for determination and exchange. More species of fungi were described by him than by all other American botanists together, and the types, or orginal specimens, of these species were all preserved in his collection. Among the contributors whose names frequently appear, the following are perhaps the best known: Messrs. H. W. Ravenel, A. B. Langlois, G. Martin, W. W. Calkins, S. H. Demetrio, E. Bartholomew, E. Bethel, F. W. Anderson, W. C. Carpenter, H. W. Harkness, C. L. Smith, A. P. Morgan, B. M. Everhart, A. Commons, J. Macoun, J. Dearness, A. C. Waghorne and Charles Wright.

Since 1900 there has been no very large single collection of fungi added to the herbarium, but specimens have been derived from many different sources, chiefly through material sent in for determination and through explorations conducted by members of the Garden Staff. Certain groups that were poorly represented in the Ellis collection, such as the gill-fungi and many of the large wood-loving species, have recently been collected in great quantities in Maine, New Hampshire, New York, New Jersey, Pennsylvania, Virginia, North Carolina, and Florida; and in the Bahamas, Cuba, Porto Rico, Jamaica, Costa Rica, Honduras, and other parts of tropical America.

Among those not connected with the Garden who have assisted in building up the mycological herbarium in recent years, are the following: Messrs. E. W. D. Holway, H. J. Banker, F. E. Clements, C. F. Baker, T. D. A. Cockerell, W. Trelease, G. F. Atkinson, F. S. Earle, A. D. Selby, L. Abrams, J. J. Davis, S. M. Tracy, A. A. Heller, F. E. Lloyd, C. F. Millspaugh, D. Griffiths, W. A. Kellerman, E. C. Howe, A. Nelson, R. M. Harper, W. C. Barbour, C. W. Dawson, E. Bartholomew, G. P. Clinton, D. R. Sumstine, C. V. Piper, P. L. Ricker, C. H. Peck, E. R. Memmimger, C. C. Hanmer, A. O. Garrett, J. Macoun, L. Romell, A. J. Hill, W. E. Broadway, N. M. Glatfelter, M. E. Peck, W. R. Maxon, D. S. Johnson, A. D. E. Elmer and C. H. Demetrio; and Misses A. Eastwood, S. F. Price, V. S. White, M. L. Overacker and G. S. Burlingham.

Important European collections have been recently obtained

from Abbé G. Bresadola, of Trient, Austria-Hungary, and from Mr. George Massee, of Kew Gardens, England. Sets of current European exsiccati are purchased as they appear.

Considerable attention has also been given to the collection of oriental species in certain groups. Very valuable material was acquired by Mr. R. S. Williams, assistant curator, during his explorations in the Philippine Islands, and this has been extensively supplemented by Philippine specimens sent in for determination.

Most of the specimens of groups below, and including, the rusts are mounted in packets glued on herbarium sheets such as are used in the herbarium of flowering plants. The higher groups, however, contain many bulky specimens which must be preserved in boxes, and these are in most herbaria kept in a separate series, entailing much extra labor and no little inconvenience. In order to avoid the double series here, we have had light wooden drawers made to fit the compartments in the herbarium cases and into these, in their regular order with the sheets, the boxes containing the larger specimens are placed. These drawers have the additional advantage of protecting against dust and insects, and, on the whole, appear to solve the problem as well as could be desired. Any one who has attempted to handle loose boxes in quantity will welcome some such convenient arrangement as this.

For ready reference in the comparison of these bulky specimens and for the use of students consulting the herbarium, a synoptical collection is being arranged in alphabetical order in boxes glued on cardboard, each box containing good representative specimens of a single species, with as many variations as are obtainable. This arrangement will save much time and will largely prevent the usual wear and tear and displacement of specimens in the regular collection.

In the fungus collection are many field notes of great value relating to the size, color, form, etc., of the plants when fresh. These, with photographs and colored drawings when obtainable, are pasted on the herbarium sheets or placed in the boxes, the idea being to keep everything relating to a given specimen as close to it as possible. The same disposition is also made of

notes taken in foreign herbaria, characters obtained from microscopic study, and letters containing information regarding habitat, distribution and other points of interest. A collection of autograph letters from mycologists and collectors is kept separately for reference in case the identity of labels or miscellaneous data is in doubt.

Specimens preserved in alcohol or formalin are desirable in some groups, but no attempt is made to preserve any large number in this way except for special studies in morphology or for museum purposes, as such a collection is of doubtful value in taxonomic work, especially when one considers the immense amount of time, space and money involved.

The preservation of fungi against insects has always been a difficult problem for the curator. Many methods have been tried in various herbaria without complete success. Carbon bisulfid has been mainly used in this country, but the results are not satisfactory. Corrosive sublimate, so extensively employed for flowering plants, is not only valueless but decidedly harmful to many of the higher fungi, since it alters or destroys their surface characters and often changes their substance to a marked degree. It is much better to lose some specimens than to have the whole collection thus altered. In the case of large woody specimens, also, it is very difficult to secure sufficient penetration to preserve the interior portions.

The substance I have used with great success is naphthalene flake, of the best quality. Experiments conducted here have shown that adult insects are killed in a few hours when placed in a box with this substance, and it is probable that those emerging from the pupa stage succumb in less time. Specimens are treated when first obtained, and those peculiarly susceptible are kept in an atmosphere of naphthalene more or less all of the time. In going through the collections, when a packet or box is found containing insects, a spoonful or more of naphthalene is added and the incident closed. Possibly there are insects not yet acquired or some that do not thrive in this region that are not amenable to this treatment, but it has been more satisfactory here so far than any other method I have seen tried.

All fungi found upon leaves are treated with corrosive sublimate. This is done chiefly to preserve the leaves intact, the fungi being so small that, with few exceptions, insects would hardly do them serious damage. All other fungi, particularly the conspicuous forms known as mushrooms, bracket fungi, etc., are placed in boxes with naphthalene flake for several weeks or longer, according to the season, before distributing them in the herbarium. Groups peculiarly liable to attack are examined once or twice a year and fresh naphthalene added when necessary. After a box collection has been once cleared of pests, it is not so difficult to keep them out, with a fair amount of precaution and vigilance.

At Kew Gardens, fungus specimens are treated once a year with carbolic acid (or a cheaper substitute) and alcohol. This mixture is easily applied with a brush to the large number of specimens there that are pasted flat on the sheets without packets.

Dr. Magnus, of Berlin University, advocates the carbon bisulfid treatment once a year, in case there is not sufficient time for separate treatment of specimens with corrosive sublimate, which latter he considers superior. Dr. Magnus works almost entirely with rusts and other minute fungi that attack the leaves of plants.

Dr. Patouillard, of Paris, uses corrosive sublimate exclusively for all groups of fungi, simply immersing the specimens in a mixture of sublimate and alcohol. He is of the opinion that this is the only practical method of preserving them. He says that naphthalene is very good at first, but that when it evaporates the insects return. This might not be possible if his specimens were in close-fitting boxes.

Mr. Hennings, of the Berlin Botanical Garden, uses corrosive sublimate also, having no faith in naphthalene.

Abbé Bresadola, of Trient, claims that insects are entirely killed or expelled by naphthalene and that this substance is far superior to carbon bisulfid, chloroform, strychnine, corrosive sublimate, or carbolic acid. He places fresh specimens of woody forms that are infested with insects in a tight box with naphthalene for a day or less, then dries them and keeps them in a drawer

for several weeks with naphthalene before removal to the herbarium. Agarics, because of their perishable nature, are dried before treatment. No naphthalene is used in the regular collection and none appears to be necessary, as I did not find a single insect in his entire herbarium, and not one has appeared in the thousand packets of fungi obtained from him for our collection.

Lars Romell, of Stockholm, follows Bresadola in the use of naphthalene and has no use whatever for sublimate, claiming that specimens are worthless unless recognizable. He frequently places infected agarics under a belljar with chloroform on returning from the field, in order to kill the insects before drying the specimens.

The value of this immense collection of fungi can hardly be overestimated. From a purely botanical standpoint, it is highly important that original and representative specimens of all groups of plants be thus preserved for the purposes of reference and comparison ; and, since questions of origin, distribution and variation always enter into studies of classification, it is desirable to have these collections as complete as possible. From the standpoint of applied botany, the vast number of destructive plant diseases caused by fungi relate this subject very intimately with horticulture, agriculture, forestry and allied sciences. The damage done in this country by wheat rust alone amounts to several billions of dollars annually, and there are other fungus diseases almost as destructive. The fact that practically all of the chestnut trees in and about New York city have been killed in the past few years by a fungus not heretofore known cannot fail to impress one with the importance of the fungi in relation to forestry, both as regards the host of destructive forest diseases already known and those that may yet be discovered.

Aside from the use of this collection by systematic botanists, plant pathologists and foresters, there is a large and increasing interest in fungi by the plant-loving public, drawn by fondness for the queer and unknown, or attracted by bright colors and peculiar forms, or by their extensive use as food. To all these, the collection affords the keenest pleasure and offers opportunities for further knowledge and enjoyment.

This collection is to be the basis of nine volumes of the North American Flora. As the various groups of fungi are worked over and new species published, the number of type specimens in the herbarium will be greatly increased. Students, collectors and investigators of fungi throughout the country will continue to send in specimens for determination and comparison, and will come here in greater numbers to consult not only the originals, but the array of additional specimens that show the variation and the geographical distribution of given species and groups of species.

As material accumulates, without doing violence to the integrity of the collection, duplicates will be sent out in exchange for material from new regions, and to various botanical institutions for the purpose of stimulating activity along certain lines of collecting.

It is hoped that important contributions may in time be made to questions of geographical distribution on the basis of these various collections from distinct regions. For the purpose of recording the distribution of species conveniently and quickly, the distribution chart found at the end of this number of the JOURNAL has been prepared; copies of which are properly marked and pasted on the inside of the species covers, to show at a glance just where a particular species has been collected.

If one wishes to distinguish plants from different regions in the herbarium, he may use gummed paper markers of different colors on the genus covers, or simply indicate the regions by numbers or letters, as shown in the following table:

I. North America	Na	White.	
II. Tropical America	Ta	Red.	
III. South America	Sa	Blue.	
IV. Europe and Siberia	Es	Gray.	
V. Africa	Af	Black.	
VI. India	In	Orange.	
VII. China and Japan	Cj	Yellow.	
VIII. Malaya	Ma	Brown.	
IX. Australia	Au	Pink.	
X. Islands	Is	Green.	

W. A. MURRILL.

THE BANYAN TREE.

In the northwest corner of house no. 4 of the public conservatories will be found a specimen of this interesting tree, which is so highly esteemed by the Hindus. As the accom-

FIG. 3. A young banyan tree in the conservatories.

panying illustration indicates, this specimen is beginning to show plainly the growth of the large aerial roots which make this tree an object of wonder to travelers ; but it can, of course, but faintly suggest its magnificent appearance in its native home along the lower reaches of the Himalayas and the Dekhan peninsula. There are many other trees which attain the height of the banyan tree, but the latter is remarkable for the great spread of its branches, which extend horizontally and send down roots which eventually reach the ground ; and many of these, increasing greatly in diameter, form subsidiary trunks, so that the final effect is more that of a small grove than of a single tree.

The size to which this tree grows in its native wilds is not definitely known, but there are many trustworthy records of its great size in a state of cultivation. There was a specimen growing at Satara in 1882, said to have an average diameter of five hundred and twenty feet in the spread of its branches, and a girth of over fifteen hundred feet. This mere statement, perhaps, does not convey an adequate idea of its magnificent proportions ; but think of such a tree as not only entirely filling the house in which the conservatory specimen is located, but of covering an area with a diameter equal to the entire length of the conservatory range ! One has perhaps heard the statement that a banyan tree could shelter under its branches an army of twenty thousand men ; the tree at Satara would furnish shelter for over fifty thousand men, allowing four square feet for each man.

Another remarkable specimen, somewhat smaller than the one at Satara, is in the botanical garden at Calcutta, and is about one hundred and twenty-five years old. It was described some years ago by Dr. King, who gave the girth of the main trunk as forty-two feet, the circumference of the leafy crown as eight hundred and fifty-seven feet, and the number of aerial roots as two hundred and thirty-two. It originated about 1782 from a seed dropped in the crown of a date-palm, presumably by some bird, a common method of dissemination of this and other similar trees. Following its usual custom, it grew vigorously, tightly encompassing the sheltering and supporting palm with its roots, and finally strangling it, taking the place of its foster parent in the vegetable world.

The banyan tree is often a very active agent in the destruction of the walls of temples and other buildings. A seed, deposited by some passing bird in a crevice of some wall, soon germinates, sending its stout roots further and further into the crevice, and finally destroys the structure. One would immediately suggest that such destruction might be avoided by merely uprooting the young plants; but this tree is held sacred by the Hindus, and, if any damage threatened the young tree, the building, and not the tree, would be sacrificed.

The word "banyan" seems to have been first applied to a large tree of this species which grew at Gombroon. This specimen was a favorite of the "Banyans," or Hindu traders, who had settled at this place and had built a pagoda under its branches.

Economically, the banyan tree is of considerable importance to the people in the regions where it grows. It yields a milky juice, as others of this genus do, and from this an inferior quality of rubber is extracted. It is also made into a bird-lime by mixing with it a certain proportion of mustard-seed oil. A coarse rope and more or less paper are made from its bark. Medicinally, it is used externally to relieve pains and bruises, and it is considered of great value as an application for the soles of the feet when cracked or inflamed. An infusion of the bark is considered of great value as a tonic and in the treatment of diabetes. In times of scarcity the small red figs are eaten by the poorer classes, this large tree being a relative of the fig-tree which furnishes the edible figs of commerce. The leaves and young twigs are eaten with apparent relish by elephants and cattle. The leaves also fill another want, for they are frequently used as plates. The wood is said to be of moderate hardness, but is not of much value; its durability in the presence of moisture, however, makes it useful for well-curbs. The wood of the aerial roots is said to be stronger, and this is often used for tent-poles, cart-yokes, etc.

The genus *Ficus*, of which the banyan tree is but one species, is widely distributed, almost exclusively in tropical regions, in both the old world and the new, being especially abundant in the former. At the present time there are said to be about six hun-

dred known species, of which two are well known to many as the rubber plant, *Ficus elastica*, and the edible fig, *Ficus Carica*. All of them have the peculiar fruit known as a fig, consisting of a modified branch in the shape of a hollow receptacle, on the inside of which are borne the numerous flowers, the pistillate ones developing the small seeds, which are so numerous in the edible fig.

In the immediate vicinity of the banyan tree in house no. 4 will be found a number of other species of the genus *Ficus*, including a large specimen, in the center of the house, of the common rubber plant, *Ficus clastica*.

GEORGE V. NASH.

PREAMBLE AND RESOLUTION ADOPTED BY THE SCIENTIFIC DIRECTORS RELATIVE TO THE DEATH OF PROFESSOR LUCIEN M. UNDERWOOD.

WHEREAS, Death has removed from this Board Professor Lucien Marcus Underwood, our associate from the commencement of our organization, and our chairman since the year 1901,

We therefore desire to record an expression of our profound sorrow at the severance of such happy personal relations as have always existed between the deceased and members of this Board, and at the untimely ending of a career of such present value and of such great promise.

We desire also to place upon record our appreciation of the great value to the New York Botanical Garden of the services rendered by Professor Underwood, both in his official capacity and by virtue of his high and broad scholarship.

As our chairman, Professor Underwood has always performed his duties in a prompt, studious and efficient manner, and has shown rare wisdom in conserving the higher interests of the institution and of those served by it.

As an original investigator in those lines of research which it is the object of the Garden to promote, Professor Underwood has

displayed untiring energy, combined with independence and originality, and his work has been fruitful in many important contributions to science.

As an adviser and guide in the investigations of others, here and elsewhere, Professor Underwood has exerted a wide influence, and has displayed unselfish devotion and a generous regard for the interests of those so engaged.

The cheerfulness and general good-fellowship of Professor Underwood in his personal relations with us, and with the members of the Garden Staff, have been such as to combine the most pleasant recollections with the most sorrowful regret that we are to enjoy them no more.

Resolved, that a copy of this memorial be transmitted to the family of Professor Underwood, and that the same be entered upon our minutes and published in the Garden JOURNAL.

(Signed) J. F. KEMP,
Secretary.

December 14, 1907.

NOTES, NEWS AND COMMENT.

At a recent meeting of the board of managers, Dr. W. A. Murrill was advanced from the position of first assistant to that of assistant director.

Dr. M. A. Howe and Percy Wilson returned from the Bahamas January 5, with a large collection of plants, in which both terrestrial and marine species are well represented.

Mr. W. R. Maxon, of the U. S. National Museum, spent several days at the Garden early in January examining the fern collections.

Dr. N. L. Britton attended the meetings of the American Association for the Advancement of Science and Affiliated Societies at Chicago during the holidays.

Mr. H. S. Jackson, of the State Experiment Station, Newark, Delaware, spent the latter part of December at the Garden studying the fungus collections from Delaware.

Professor J. C. Arthur and Mr. F. D. Kern, of Purdue Uni-

versity, were awarded research scholarships for the month of January, to aid them in their investigations of the North American species of rusts (Uredinales), a group of parasitic fungi very destructive to cultivated plants.

The orchids are at their best during January and February. The large additions of rare and attractive species during the past year make the collection one of great interest and beauty.

Some Recent Visitors. — Professor W. L. Bray, of Syracuse University; Professor A. W. Evans, of Yale University; Dr. C. F. Millspaugh, of the Field Museum of Natural History, Chicago; Professor A. H. Graves, of the Yale Forestry School; Professor John F. Cowell, Director of the Buffalo Botanic Garden; and Mr. Stewardson Brown, of the Academy of Natural Sciences, Philadelphia.

Meteorology for December. — The total precipitation for the month was 4.42 + inches. Maximum temperatures were recorded of 57° on the 8th, 58° on the 10th, 55° on the 23d, and 53° on the 28th; also minimum temperatures of 18° on the 5th, 23° on the 13th, 22° on the 20th, and 26.5° on the 25th and 27th.

The maximum temperature recorded for the year was 93°, occurring on July 8, 18, and 25; the minimum temperature for the year was — 2°, on February 6; the mean temperature for the year, therefore, was 45.5°. The total precipitation recorded for the year 1907 was 47.01 + inches. The first fall frosts occurred during the first week in October.

ACCESSIONS.

LIBRARY ACCESSIONS FROM NOVEMBER 1 TO DECEMBER 31, 1907.

ARTHUR, JOSEPH CHARLES & MACDOUGAL, DANIEL TREMBLY. *Living plants and their properties.* New York, 1898. (Deposited by the Trustees of Columbia University.)

BRITTON, NATHANIEL LORD. *Manual of the Flora of the Northern States and Canada.* Ed. 2 [second impression]. New York, 1907. (Given by the author.)

ELGOOD, GEORGE S. *Italian gardens.* London, 1907.

HEIDENHAIN, MARTIN. *Plasma und Zelle.* Erste Abteilung: Allgemeine Anatomie der lebendigen Masse. Lief. 1. Jena, 1907.

LAKOWITZ, CONRAD. *Die Algenflora der Danziger Bucht.* Danzig, 1907.

LOUDON, JOHN CLAUDIUS. *An encyclopaedia of agriculture.* Ed. 4. London, 1839. (Given by the Trustees of Columbia University.)

MATSUMURA, JINZO. *Index plantarum japonicarum.* Tokioni, 1904–05. 2 vols.

MATSUMURA, JINZO & HAYATA, BUNZO. *Enumeratio plantarum in insula Formosa sponte crescentium.* Tokyo, 1906. (Given by Dr. C. B. Robinson.)

MAURY, MATTHEW FONTAINE & FONTAINE, WILLIAM MORRIS. *Resources of West Virginia.* Wheeling, 1876. (Given by Dr. J. H. Barnhart.)

MILLER, PHILIP. *Gardener's dictionary.* London, 1731.

NEGER, FRANZ WILHELM. *Die Nadelhölzer (Koniferen) und übrigen Gymnospermen.* Leipzig, 1907. (Deposited by the Trustees of Columbia University.)

[NIEDERLEIN, GUSTAVO, *and others.*] *Official handbook. Description of the Philippines.* Part 1. Manila, 1903. (Given by Dr. J. H. Barnhart.)

Proceedings of the Society for Experimental Biology and Medicine. Vols. 1–4. 1904–7. (Given by Dr. William J. Gies.)

STEVENS, WILLIAM CHASE. *Plant anatomy . . . and handbook of micro-technic.* Philadelphia, 1907.

WATT, GEORGE. *The wild and cultivated cotton plants of the World.* London, 1907.

WIESNER, JULIUS. *Der Lichtgenuss der Pflanzen.* Leipzig, 1907.

WOOLSON, GRACE A. *Ferns and how to grow them.* New York, 1906.

ZELLNER, JULIUS. *Chemie der höheren Pilze.* Leipzig, 1907.

ZOPF, FRIEDRICH WILHELM. *Die Flechtenstoffe in chemischer, botanischer, pharmakologischer und technischer Beziehung.* Jena, 1907.

PICTURE COLLECTION.

1 photograph of a view in Bronx Park. (Given by Dr. N. L. Britton.)

1 portrait of Professor Charles F. Chandler. (Given by Dr. N. L. Britton.)

5 photographs of botanists. (Given by Mrs. N. L. Britton.)

1 photograph of Porto Rico. (Given by Mrs. N. L. Britton.)

1 photograph of Evening Primroses in Professor de Vries' garden, Amsterdam. (Given by Mrs. N. L. Britton.)

1 photograph of Abbé G. Bresadola. (Given by Dr. W. A. Murrill.)

1 photograph of a portrait of Linnaeus. (Given by Dr. P. A. Rydberg.)

18 plates from various sources.

MUSEUMS AND HERBARIUM.

4 specimens of drugs. (Given by Dr. H. H. Rusby.)

634 specimens of Texas plants. (By exchange with the Missouri Botanical Garden.)

5 specimens of North American ferns. (Given by Professor L. M. Underwood and Dr. Philip Dowell.)

1 fern. (Given by Mr. H. D. House.)

25 wax models of tropical fruits. (Made by Mr. A. Hyatt Verrill.)

2 specimens of fungi from British Columbia. (Given by Mr. E. W. D. Holway.)

68 specimens of flowering plants from Missouri. (Given by Mr. B. F. Bush.)

27 specimens of ferns. (Given by Dr. Philip Dowell.)

485 specimens of Mexican plants. (Collected by Dr. E. Palmer.)

5 specimens of *Viola* from South Carolina. (Given by Mr. H. D. House.)

2 specimens of *Cunninghamites elegans* from North Carolina. (Given by Mr. E. W. Berry.)

3 specimens of flowering plants from Lake Morey, Vermont. (Given by Dr. Arthur Hollick.)

3 specimens of coniferous plants from California. (Given by Mrs. H. L. Britton.)

4 specimens of ferns from Palisades Park, New Jersey. (Given by Mr. F. Pauls.)

32 specimens of North Amer can ferns. (Given by Mr. R. C. Benedict.)

449 specimens of cryptogams from Guadeloupe and Martinique. (Collected by Père Duss.)

5 specimens of fungi from Forked River, New Jersey. (Given by Mr. W. H. Ballou.)

9 specimens of fungi from Missouri. (Given by Dr. N. M. Glatfelter.)

1 specimen of Travertine from the Salton Basin, Arizona. (Given by Dr. D. T. MacDougal.)

4,500 lichens, being the collection of Dr. H. E. Hasse. (Given by Mr. John I. Kane.)

1 specimen of *Monotropa* from Florida. (Given by Mr. H. S. Fawcett.)

80 specimens of polypores from West Virginia. (By exchange with Mr. C. P. Hartley.)

13 specimens of mosses from Georgia and Massachusetts. (Given by Mr. H. H. Bartlett.)

1 specimen of *Plagiothecium Muellerianum* from Manchester Centre, Connecticut. (Given by Miss Annie Lorenz.)

1 specimen of *Yara Cardamonis.* (Given by Parke, Davis and Company.)

4 specimens of drugs. (Given by Dr. H. H. Rusby.)

1 specimen of the fruit of *Passiflora incarnata.* (Given by Dr. W. A. Murrill.)

3 specimens of North American food plants. (Given by Dr. H. H. Rusby.)

1 specimen of *Callistemon lanceolatus* from Florida. (Given by Professor P. H. Rolfs.)

4 specimens of fruits of North American trees. (Given by Dr. J. A. Shafer.)

125 specimens of flowering plants from Guatemala. (Collected by Mr. H. von Turckheim.)

6 specimens of twigs of North American trees. (Given by Dr. J. A. Shafer.)

270 specimens of California plants. (Collected by Mr. A. A. Heller.)

PLANTS AND SEEDS.

5 plants for conservatories. (By exchange with United States National Museum, through Dr. J. N. Rose.)

44 plants for nursery. (Given by Mr. W. W. Eggleston.)

1 plant for conservatories. (By exchange with Mr. F. Weinberg.)

5 packets of seed. (Given by Dr. H. H. Rusby.)

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PUBLICATIONS

OF

The New York Botanical Garden

Journal of the New York Botanical Garden, monthly, illustrated, containing notes, news and non-technical articles of general interest. Free to all members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp. Vol. II, 1901, viii + 204 pp. Vol. III, 1902, viii + 244 pp. Vol. IV, 1903, viii + 238 pp. Vol. V, 1904, viii+242 pp. Vol. VI, 1905, viii+224 pp. Vol. VII, 1906, viii + 300 pp. Vol. VIII, 1907, viii + 290 pp.

Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations carried out in the Garden. Free to all members of the Garden; to others, $3.00 per volume. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Vol. II, Nos. 6–8, 518 pp., 30 plates, 1901–1903. Vol. III, Nos. 9–11, 463 pp., 37 plates, 1903–1905. Vol. IV, No. 12, 113 pp.; No. 13, 193 pp., 12 plates; No. 14, 170 pp. Vol. V, No. 15, 105 pp., 1906; No. 16, 88 pp., 17 plates, 1906; No. 17, 115 pp., 1907.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies and Central America. Planned to be completed in thirty volumes. Roy. 8vo. Each volume to consist of four or more parts. Subscription price $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Vol. 22, part 1, issued May 22, 1905, contains descriptions of the order Rosales by Dr. J. K. Small, and of the families Podostemonaceae by Mr. Geo. V. Nash, Crassulaceae by Dr. N. L. Britton and Dr. J. N. Rose, Penthoraceae and Parnassiaceae by Dr. P. A. Rydberg.

Vol. 22, part 2, issued December 18, 1905, contains descriptions of the families Saxifragaceae and Hydrangeaceae by Dr. J. K. Small and Dr. P. A. Rydberg; the Cunoniaceae, Iteaceae and Hamamelidaceae by Dr. N. L. Britton; the Pterostemonaceae by Dr. J. K. Small; the Altingiaceae by Percy Wilson and the Phyllonomaceae by Dr. H. H. Rusby.

Vol. 7, part 1, issued Oct. 4, 1906, contains descriptions of the families Ustilaginaceae and Tilletiaceae, by Professor G. P. Clinton.

Vol. 7, part 2, issued March 6, 1907, contains descriptions of the families Coleosporiaceae, Uredinaceae and Aecidiaceae (pars), by Professor J. C. Arthur.

Vol. 25, part 1, issued August 24, 1907, contains descriptions of the family Geraniaceae by Miss L. T. Hanks and Dr. J. K. Small, the Oxalidaceae and Linaceae by Dr. J. K. Small, and the Erythroxylaceae by Dr. N. L. Britton.

Vol. 9, part 1, issued December 19, 1907, contains descriptions of the Polyporaceae (pars), by Dr. W. A. Murrill.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book, including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by Dr. D. T. MacDougal, assistant director. An account of the author's researches with a general consideration of the relation of light to plants. The principal morphological features are illustrated. xvi + 320 pp. Roy. 8vo, with 176 figures.

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume.

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Vol. IV. Nos. 76–100, vi + 444 pp. 20 figures in the text and 29 plates.

RECENT NUMBERS 25 CENTS EACH.

97. The Sedges of Jamaica, by N. L. Britton.
98. The Genus Antrophyum—I, by R. C. Benedict.
99. Some Philippine Polyporaceae, by W. A. Murrill.

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JOURNAL

OF

The New York Botanical Garden

EDITOR

WILLIAM ALPHONSO MURRILL

Assissant Director

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JOURNAL

OF

The New York Botanical Garden

VOL. IX. February, 1908. No. 98.

THE HERBARIUM OF THE LATE DR. OTTO KUNTZE.

Dr. Otto Kuntze, a distinguished German botanist who died at San Remo, Italy, on January 28, 1907, accumulated during his busy life a large and important herbarium which was offered for sale. Through the generosity of Mr. Andrew Carnegie, vice-president of the board of managers, this valuable collection of prepared specimens of plants has been acquired by the New York Botanical Garden. It comprises 403 boxes about 8 inches long, 12 inches wide, and 6 inches deep, of dried specimens attached to sheets of paper, thoroughly poisoned to prevent insect depredation and carefully labeled by Dr. Kuntze. A rough estimate indicates that there are over 30,000 specimens.

This herbarium contains plants from all parts of the world, and includes specimens of many species not heretofore represented in the collections of the Garden. Dr. Kuntze travelled widely and collected and observed plants in many countries. During the years 1874–1876 he made a trip around the world, proceeding from Bremen to the West Indies and collecting on the islands of St. Thomas, Porto Rico, and Barbados; thence to Trinidad, Venezuela, and Colombia; thence to Panama and Costa Rica, returning to Panama; he reached New York in July, 1874, and proceeded westward, collecting in New Jersey, New York, Ohio, Illinois, Missouri, Kansas, Nebraska, Colorado, Wyoming, Idaho, Nevada and California; he reached Japan in December of that year, and in January proceeded to China where he collected

about Hongkong and Canton, in Anam, Cochin China and Siam, proceeding to Java, Singapore, Penang, Birma, thence to India, where he explored about Calcutta, going north into Sikkim, returning to Bengal and Bombay ; the early part of the year 1876 he spent in Arabia and Egypt.

He visited eastern Asia and Russia in the year 1886, and the Canary Islands in 1887–1888.

In December, 1891, he proceeded to South America, reaching Montevideo in December and remaining in Uruguay, and in the Argentine Republic through part of January, 1892. He crossed the Andes into Chili, collecting at several localities, including the Desert of Atacama, proceeded to Bolivia, where he visited regions botanically very little known, and remained in that country through the summer, reaching Paraguay in September and proceeding to Brazil at the end of the year, reaching Pernambuco December 27, 1892.

In January, 1894, he explored in South Africa, landing at the Cape of Good Hope and collecting in Cape Colony, the Orange Free State, the Transvaal and Natal, reaching Durban in March and proceeding northward by sea to Delagoa Bay, Beira, Mozambique, Dar-es-Salam and Zanzibar, returning to Europe by the Suez Canal.

His last extensive trip was made in 1904, when he reached Ceylon in February, proceeded to Australia, Tasmania, New Zealand, Samoa, the Sandwich Islands, and returned to Europe by way of the United States.

He studied his extensive collections principally at the Royal Botanical Garden in Berlin and at the Royal Gardens at Kew, England, where the writer had the pleasure of meeting him for the first time in 1888. The scientific results of these expeditions are mostly presented by him in the three volumes entitled "Revisio Generum Plantarum, cum Enumeratione Plantarum Exoticarum in Itinere Mundi Collectarum," published from 1891 to 1898 ; in these he gives a list of plants collected, with many critical notes, records of geographic distribution, descriptions of species new to science, and discussions of nomenclature, this subject being one to which he paid enthusiastic attention and through which he

will probably be best known in the future. A considerable part of his collections was referred to other experts for critical study.

To American botanists the greatest interest of his herbarium is in the large number of type specimens which it contains of species from South America and Tropical America described either by himself or other botanists; he collected few duplicates, his rapid movements from place to place during his travels requiring that he should reduce his luggage to as small an amount as practicable, and in a large number of cases the specimens obtained for the Garden by the generosity of Mr. Carnegie are thus unique, not being represented at any other institution.

N. L. Britton.

THE COLLECTIONS OF MOSSES AND HEPATICS.

The moss collections at the Garden are arranged in two series, like those of the fungi, one in the museum of systematic botany on the second floor of the museum building and the other in the moss room and in the cryptogamic laboratory on the top floor. The former is for the benefit of teachers and the general public, the latter for the use of students only.

The public museum collection consists of about 599 specimens and illustrations and is installed in 8 cases and 12 swinging frames. The structure of *Funaria hygrometrica*, *Mnium cuspidatum*, *Polytrichum commune*, and two species of *Frullania* are also illustrated by microscopic exhibits. Specimens are mounted on blocks or cardboard or preserved in formalin. Illustrations have been obtained for most of the species exhibited, and specimens in bulk have been secured to show their habit of growth and general appearance.

The swinging frames are designed to illustrate the local flora, or all species known to grow within a radius of 100 miles from New York City, and to give the range of each species and its common name: 468 species are included in this series, 384 of these being mosses and 84 hepatics.

The study collection of these plants may be found on the top floor, the mosses in the cryptogamic laboratory, under Mrs.

Britton's care, and the hepatics with the algae, under Dr. Howe's care. The acquisition of the Mitten Herbarium of mosses and hepatics, an account of which was published in the JOURNAL for February, 1907, has made necessary a great deal of mounting, as all his specimens were laid loosely in folders or pinned to sheets and these are gradually being incorporated with collections already at the Garden. The American species, including those from South America, Central America and the West Indies are being mounted first, and these have made possible many comparisons and exchanges which throw light on our knowledge before the publication of the volume on mosses of "North American Flora." It is increasingly evident that there has been much duplication of naming by various European authors and we acknowledge our obligations to Professor Max Fleischer and Dr. Urban of the Royal Botanical Garden and Museum at Berlin for numerous comparisons with the originals of American species named by S. E. Bridel and Karl Müller. We are also under lasting obligations to Mr. C. H. Wright at Kew Gardens and Mr. Anthony Gepp at the British Museum of Natural History at South Kensington for comparisons with valuable collections preserved at these two institutions. It is expected that some adequate acknowledgment will be made when we come to distribute the duplicates from the Mitten Herbarium and the large number which have accumulated as a residue from our West Indian collections. We are also indebted to Messieurs Renauld and Cardot for portions of types or authentic specimens of many of their Central American and North American species and have arranged for an exchange of notes and specimens with Mr. V. F. Brotherus, who is enumerating the mosses of the world for Engler and Prantl's Natürlichen Pflanzenfamilien.

An effort has been made to follow critically all the species listed from North America and a card catalogue has been kept for this purpose, to which are added corrections in synonymy and extensions of range. These cards now record 148 acrocarpous genera with 1,642 species and 98 pleurocarpous genera with 491 species, and the enumeration is not yet completed.

From Mr. William R. Maxon, of the National Museum, we

have received duplicates for determination of all his West Indian and Central American collections, and Dr. George N. Best has continued to examine and report on all the Leskeaceae sub mitted to him for study.

Mr. R. S. Williams has devoted much time to studying the collections made by him in Bolivia and has extended his studies northward along the Andes into Central America and Mexico; extensive collections by C. G. Pringle and Jared G. Smith in Mexico, Percy Wilson in Honduras and W. R. Maxon in Costa Rica having been submitted to him for determination.

Before the death of Professor Underwood his collections of hepatics had been purchased for the Garden and these with the Mitten specimens and the Austin Herbarium have been arranged so that they are available to students of these groups in the room where Dr. Howe can give them personal supervision. Miss C. C. Haynes has availed herself of this privilege and for several years has devoted her time during the winter to naming miscellaneous collections from various parts of the United States in connection with her work as Hepatic Curator of the Sullivant Moss Chapter.

Occasional visits are made by Dr. Evans, of Yale University, who is engaged in a critical study of the Hepaticae, and he has with great patience and care named all the collections of hepatics thus far made by the various explorers sent out by the Garden. He is planning to devote several months to the arrangement of the Mitten collections of hepatics, in exchange for which he will have the privilege of selecting duplicates for the herbarium of Yale University.

ELIZABETH G. BRITTON.

THE SPREAD OF THE CHESTNUT DISEASE.*

The disease of our native chestnut, discovered in Bronx Park in 1905 and described in the JOURNAL for June and for Septem-

* Murrill, W. A. A serious chestnut disease. Jour. N. Y. Bot. Garden 7 : 143–153. *f. 13–19.* June, 1906.

Merkel, H. W. A deadly fungus on the American chestnut. Ann. Rept. N. Y. Zoöl. Society 10 : 97–103. 1906. (Illust.)

Murrill, W. A. Further remarks on a serious chestnut disease. Jour. N. Y. Bot. Garden 7 : 203–211. *f. 25–30.* September, 1906.

Murrill, W. A. A new chestnut disease. Torreya 6 : 186–189. *f. 2.* September, 1906.

ber, 1906, has continued its ravages among the chestnut trees in and about New York City with unabated virulence. Preventive measures have apparently not affected it in the slightest degree. The pruning of diseased branches has entirely failed to check it,

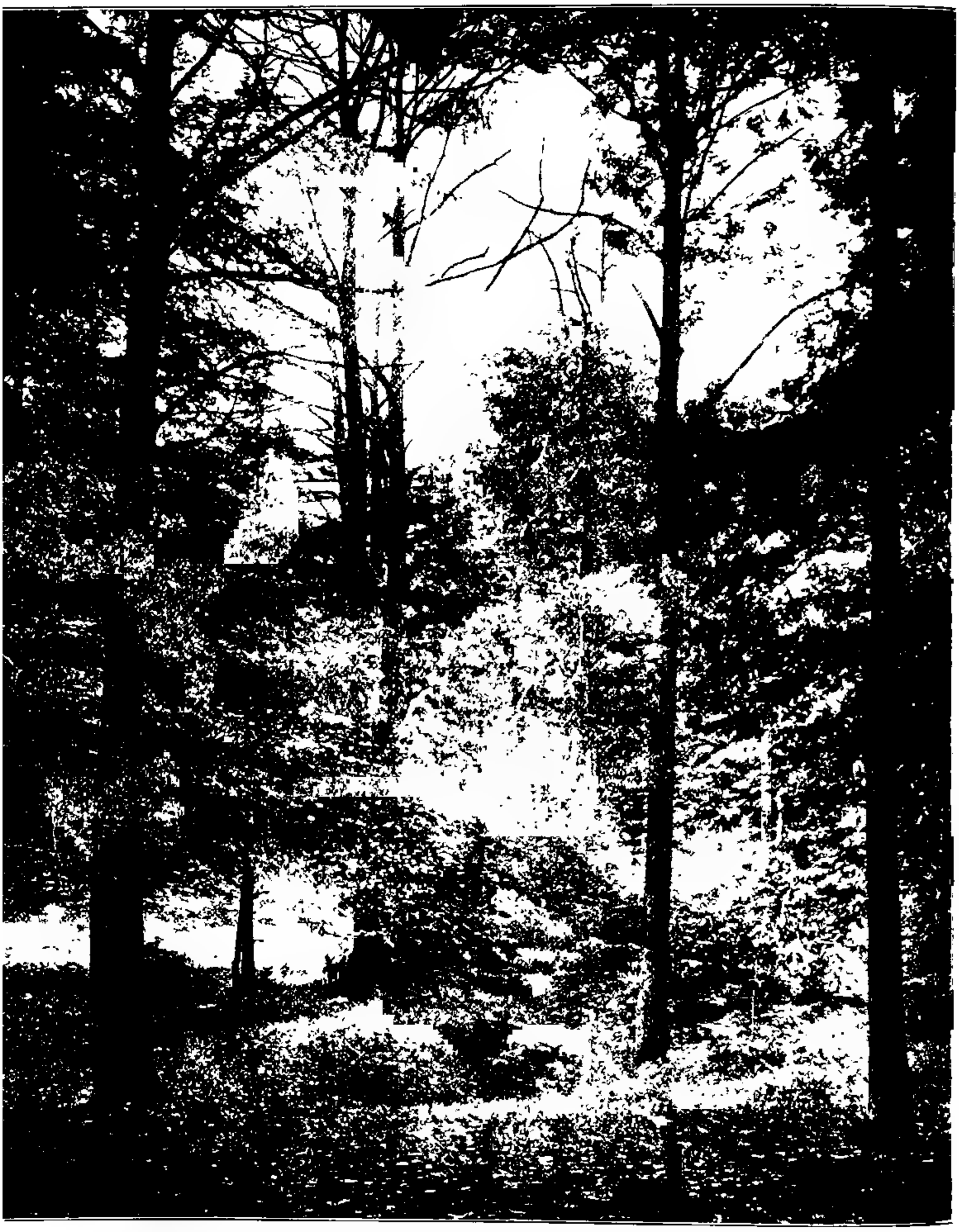

FIG. 4. Chestnut trees in the New York Botanical Garden killed by the disease.

even in the case of very young trees. Branches have been carefully removed and wounds covered, leaving trees apparently

FIG. 5. Affected chestnut trees in the nursery.

entirely sound, but upon inspection a few weeks or a few months later they would be found badly diseased at other points. From

ten to fifteen different infections were counted on single specimens of young trees near the hemlock forest during the past season. When the infections are as numerous as this no means of prevention is worth the experiment; and, moreover, some of them are practically certain to be infections of the main trunk, which cannot

FIG. 6. Inoculation experiments with young chestnut trees. Specimen on the right killed to the base of the trunk by a body infection; specimen on the left reserved as a check.

be treated by pruning. This is especially apt to occur because the spores that are washed down from diseased branches find lodgment at the base of the branch where the bark is rough and very often cracked.

The disease is abundant in and about New York City, on Long Island, and in New Jersey, and is known to occur along the Hudson as far north as Poughkeepsie. Specimens have been sent in from Connecticut, Massachusetts and Maryland. It is reported from Washington, D. C., and from Virginia, but I have

seen no specimens of it from these localities. Some have thought that the death of numbers of chestnut trees in the lowlands of Georgia and Alabama, as reported some years ago by Mohr and Small, was due to this disease, but no field studies have been made as yet to determine this point. A visit to Biltmore, N. C., however, where dead and dying chestnut trees are exceedingly abundant, failed to discover a trace of the fungus ; death apparently being due to poor soil, forest fires, the chestnut beetle, and the disturbance of natural forest conditions in various ways.

The disease was at first supposed to be confined to our native chestnut, but in the autumn of 1906 an affected branch was found upon one of the Japanese chestnut trees (*Castanea crenata*) growing in the open near the eastern boundary of the Garden. The branch was at once cut away some distance below the affected area and no other infections were noticed on the tree during the remainder of that season. During the spring and summer of 1907, also, the tree appeared healthy and it was thought that the disease had been effectually eradicated by timely pruning; but a closer examination last autumn revealed a large diseased area near the base of the trunk, and the tree will doubtless succumb soon after the next season opens.

This discovery is especially timely because of the fact that the Japanese chestnut has been under observation elsewhere in the vicinity of affected native trees and has been considered immune, so that it has been mentioned as a desirable substitute for the native tree in some of our parks.

Two specimens of chinquapin (*Castanea pumila*) recently examined in the Garden fruticetum have also been found to be badly attacked, and the indications are that they have been suffering from the disease for the past two or three years. It was reported several months ago that the cultivated chinquapins on Long Island were badly affected, but I have seen no specimens.

It is now certain that the chestnut disease attacks all species of *Castanea*, both native and cultivated, that occur in this region, namely, *Castanea dentata*, the common native chestnut, *Castanea crenata*, the Japanese chestnut, and *Castanea pumila*, the cninquapin, found native from New Jersey to Florida.

FIG. 7. Cultures of the fungus on sterilized and living chestnut branches.

It is highly important that some effort be made in the near future to determine as accurately as possible the distribution of the chestnut disease and to prevent its spread. Care should also

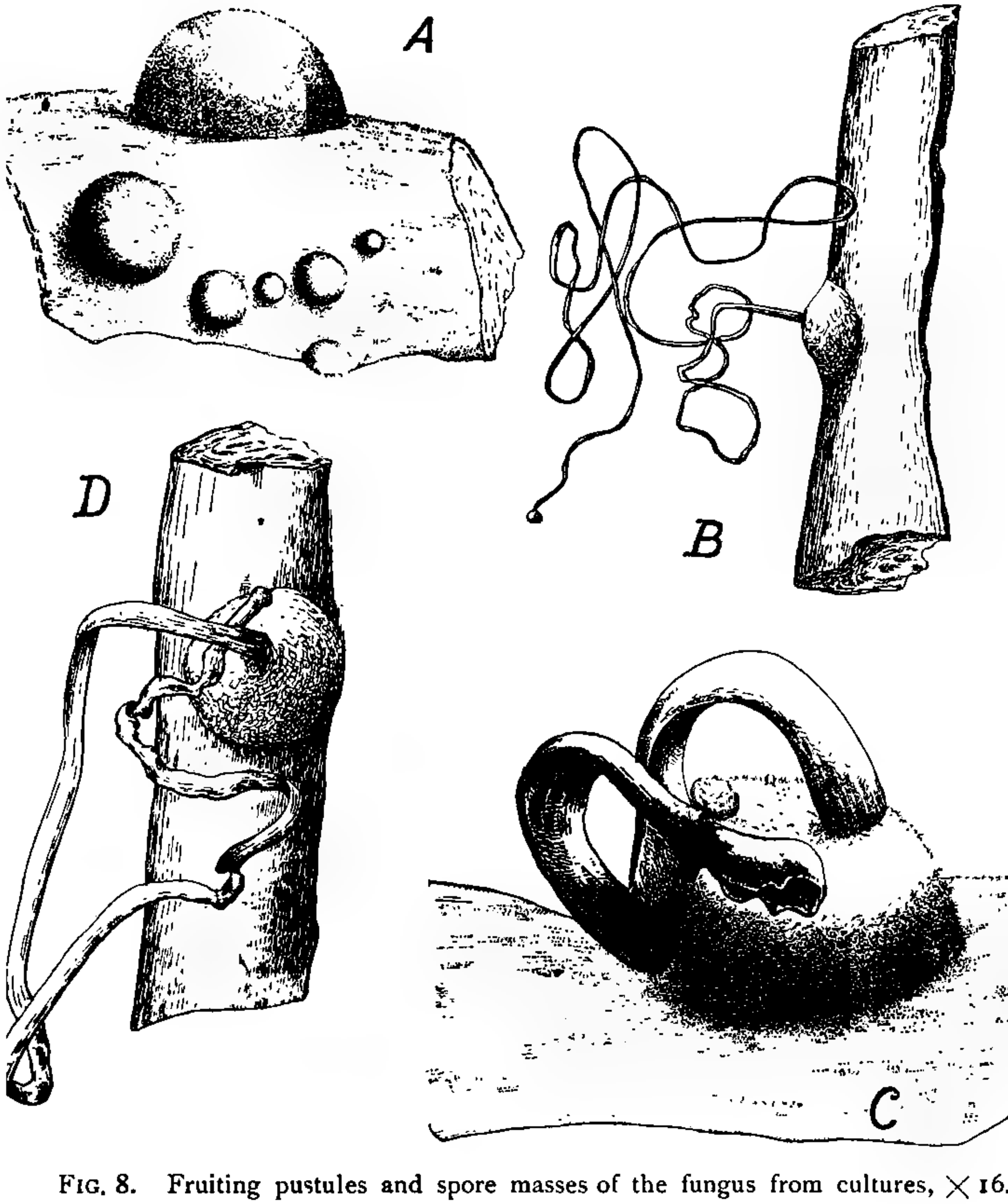

FIG. 8. Fruiting pustules and spore masses of the fungus from cultures, × 16. *A*, stages in the development of the pustules; *B*, *C*, *D*, various forms of spore discharge in a moist atmosphere.

be taken to prevent its introduction into new localities through diseased nursery stock. The chestnut growers of southern Europe should be warned against the importation of any species of *Castanea* from this country for public or private parks or

plantations without inspection by a competent person. The European chestnut is so closely related to our native tree that the fungus would doubtless attack it with equal violence, causing great loss and distress where it is cultivated.

Owners of standing chestnut timber within the affected area are advised to cut and use all trees, both old and young, that stand within half a mile of diseased trees, unless protected from infection through wind-blown spores by dense forest growth or some other natural barrier. This may not prevent the spread of the disease through the agency of storms, birds and squirrels, but it will at least retard its progress. Old weathered chestnut trunks that have been dead several years have no power to spread the disease, and these may be cut at leisure for the tannic acid factory or for firewood. Trees of good size recently killed should be turned into lumber as soon as possible; the fungus affects only the bark, but other fungi may afterwards impair the value of the wood if allowed to stand too long. Discarded branches and young trees of no value that are cut near the edge of the infected area should be burned at once in order to destroy the spores they contain; but if they are well within the zone of infection such precaution is useless.

It is not considered safe at present to put out chestnut plantations at any point within the known area of distribution of the fungus, and those made elsewhere should be started from the seed and carefully guarded.

W. A. MURRILL.

PUBLICATIONS OF THE STAFF, SCHOLARS AND STUDENTS OF THE NEW YORK BOTANICAL GARDEN DURING THE YEAR 1907.

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NOTES, NEWS AND COMMENT.

Mr. R. S. Williams, assistant curator, sailed for Colon on January 25, expecting to devote several months to botanical explorations in the Republic of Panama, a region very imperfectly known botanically.

Dr. C. B. Robinson, assistant curator since July 1, 1906, left New York January 21, for the Philippine Islands. His appointment as economic botanist of the Bureau of Science, Manila, was noted in the JOURNAL for November.

Mr. F. V. Coville, botanist in charge of the economic collections, Bureau of Plant Industry, United States Department of Agriculture, spent several days at the Garden early in February examining the herbarium.

Mr. Norman Taylor, who has been a Garden aid for several years, was recently appointed custodian of the plantations.

Mr. W. W. Eggleston has been assigned a research scholarship for two months to aid him in continuing his work upon North American Thorns, genus *Crataegus*.

Mr. George E. Davenport, an enthusiastic and well known student of North American ferns, died at Medford, Massachusetts, November 29, 1907, at the advanced age of seventy-four. Many specimens collected by him are preserved in the Underwood Fern Herbarium of the Garden.

Volume 9, part 1, of the North American Flora, appeared December 19, 1907. Volume 9, part 2, is expected to appear this month. These two parts contain descriptions of all known native species of the Polyporaceae (a large group of woody fungi), except some of the lower resupinate forms, which will be treated at the close of volume 8.

Meteorology for January.—The total precipitation recorded for January was 2.48 inches. Snow flurries occurred on the 9th, snow turning to rain on the 16th, and 10 inches of snow on the 23d and 24th. Thunder and lightning were recorded on the 12th.

Maximum temperatures were recorded of 51° between the 6th and 13th, 53° on the 13th, 60° on the 21st, and 44° on the 27th, also minimum temperatures of 13° on the 6th, 17° between the 6th and 13th, 18° on the 17th, 12° on the 25th, and 1° on the 31st. The thermograph failed to record between the 6th and 13th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

248 specimens of marine algae from Barbados, West Indies. (Collected by Miss Anna Vickers.)

6 specimens of ferns. (Given by Dr. C. B. Robinson.)

8 specimens of mosses from Texas. (Given by Professor S. W. Stanfield.)

13 specimens of mosses from Cuba. (By exchange with the United States National Museum.)

69 specimens of marine algae from North Carolina. (Given by Mr. W. D. Hoyt.)

4,125 specimens of marine algae from the Bahamas. (Collected by Dr. M. A. Howe.)

4 specimens of flowering plants from Georgia. (Given by Mr. M. H. Hopkins.)

6 specimens of mosses from New Hampshire. (Collected by Mr. Percy Wilson.)

24 specimens of mosses from Colombia. (By exchange with the United States National Museum.)

3,418 specimens of flowering plants from the Bahamas. (Collected by Mr. Percy Wilson.)

7 specimens of mosses, hepatics and lichens from the Bahamas. (By exchange with the Field Museum of Natural History.)

38 specimens of flowering plants from Louisiana. (Given by Professor R. S. Cocks.)

1 specimen of rust from British Columbia. (Given by Mr. E. W. D. Holway.)

16 specimens of rusts from western localities. (Given by Mr. Frank D. Kern.)

5 museum specimens of fungi from Forked River, New Jersey. (Given by Mr. W. H. Ballou.)

1 specimen of *Fomes geotropus* from Tennessee. (Given by Mr. Perley Spaulding.)

1 specimen of fungus on a moss from North Carolina. (Given by Dr. A. J. Grout.)

1 specimen of *Fomes* from Pennsylvania. (By exchange with Professor D. R. Sumstine.)

1 specimen of *Clitocybe amethystina* from Indiana. (Given by Professor J. C. Arthur.)

12 specimens of polypores from the Bahamas. (Collected by Mr. Percy Wilson.)

200 specimens, "Fungi Columbiani," Centuries XXV. and XXVI. (Distributed by Mr. E. Bartholomew.)

PLANTS AND SEEDS.

3 plants for conservatories. (Collected in Jamaica by Dr. N. L. Britton.)

4 plants for conservatories. (Given by Dr. D. T. MacDougal.)

1 plant for conservatories. (By exchange with United States National Museum, through Dr. J. N. Rose.)

3 plants for conservatories. (By exchange with Bureau of Plant Industry.)

1 plant for conservatories. (Given by Mr. L. M. Simonson.)

1 plant for conservatories. (By exchange with Hope Gardens, Jamaica.)

6 plants for conservatories. (Given by Mr. Hoffmann.)

3 plants for conservatories. (Given by Mr. Sacket.)

1 bulb for conservatories. (Given by Dr. H. H. Rusby.)

1 bulb for conservatories. (Given by Mr. H. C. Pearson.)

1 packet of seed. (Collected by Dr. N. L. Britton.)

4 packets of seeds. (Given by Dr. H. H. Rusby.)

1 packet of seed. (By exchange with Hope Gardens, Jamaica.)

1 packet of seed. (Given by Mr. J. Borin.)

2 packets of seed. (Collected by Dr. J. A. Shafer.)

1 packet of seed. (Given by Dr. O. Beccari, Florence, Italy.)

59 plants derived from seed from various sources.

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OF

The New York Botanical Garden

EDITOR

WILLIAM ALPHONSO MURRILL

Assissant Director

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JOURNAL

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The New York Botanical Garden

VOL. IX. March, 1908. No. 99.

REPORT ON THE BOTANICAL EXPLORATION OF THE BAHAMA AND CAICOS ISLANDS.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: We beg to present herewith a brief report on our recent expedition to the eastern and southeastern islands of the Bahamian archipelago and to the Caicos Islands, which are really a part of the Bahamas geographically, though now for more than half a century associated politically with the Jamaican government. The main object of the visit was to secure herbarium and museum specimens, illustrating both the land and marine flora, for the New York Botanical Garden and the Field Museum of Natural History of Chicago, the latter institution having shared the expense of this and several previous expeditions to the Bahamas. In fact, the present expedition was the seventh that has been sent to the Bahamas since the winter of 1904, either by the New York Botanical Garden alone or by the Garden in coöperation with the Field Museum, and, in addition, much collecting for these two institutions has been done on various islands of the group by Mr. L. J. K. Brace, a botanist resident in Nassau. On this, as on previous visits, considerable attention was given to securing living plants of scientific and economic interest for the conservatories of the Garden.

We left New York on the Ward Line steamer "City of Washington" on Friday, November 15, 1907, and reached Nassau, New Providence, on the morning of the nineteenth. Accompanied by Mr. Lewis Brace of Nassau, we sailed eastward the

following afternoon on Mr. William J. Pinder's schooner, the "Nellie Leonora," which had been chartered for us previously to our arrival. Owing to a strong head-wind and heavy seas, we put in at the Bight, Cat Island, on the afternoon of November 22. Little time was given to collecting the commoner land-

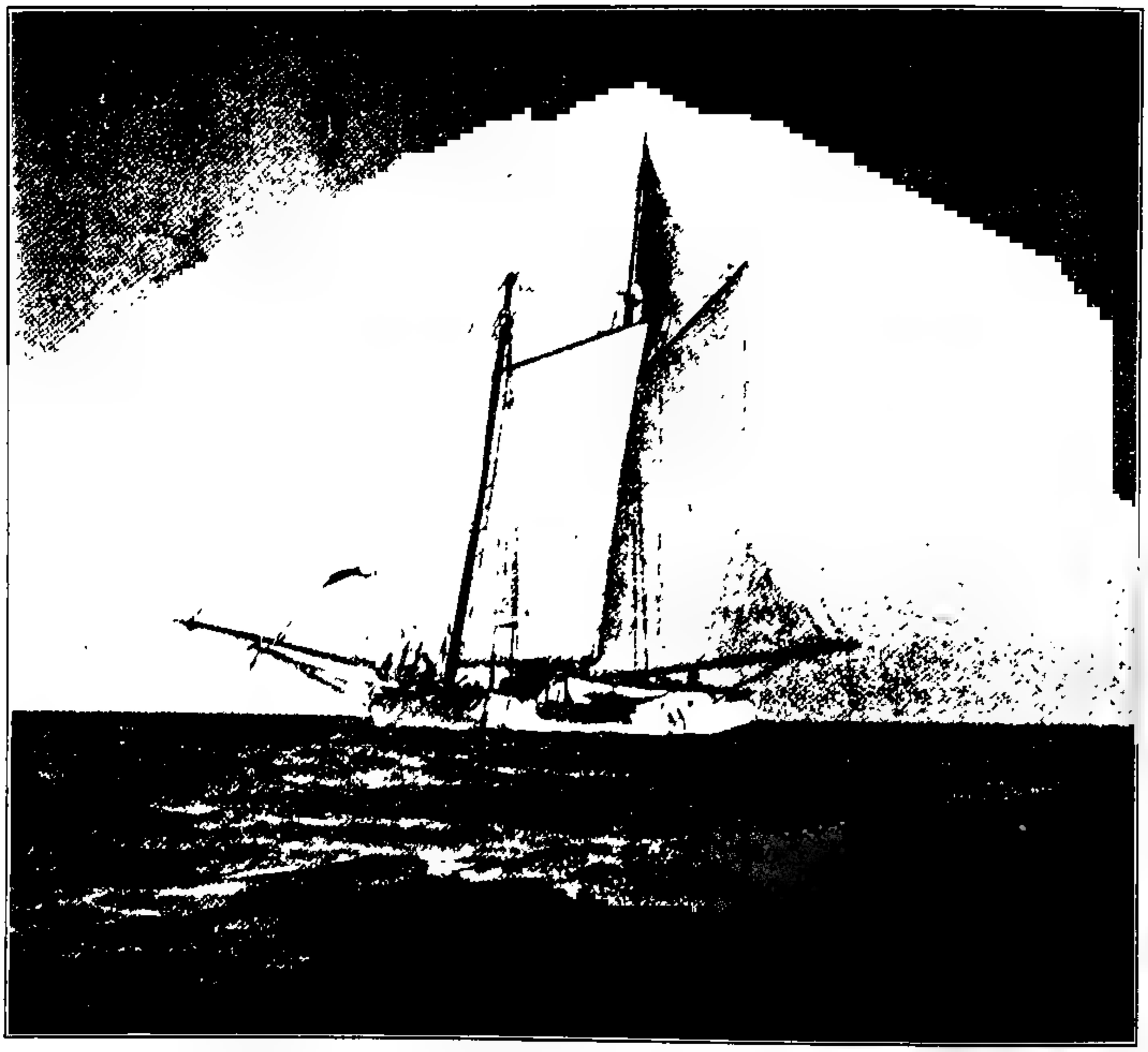

FIG. 9. The "Nellie Leonora" at Rose Island.

plants of this locality as extensive collections were made at this point earlier in the year by yourself and Dr. Millspaugh. A "creek" in this vicinity furnished a number of marine algæ of interest. Leaving the Bight at about noon on the twenty-third, we anchored at sunset near the Southwest Point of this island, where we remained for a few hours during a squall, sailing in the night for Cockburn Town ("Riding Rock"), Watling's Island, where we arrived on the twenty-fifth. Cockburn Town is the port of entry of Watling's Island, and we carried letters of intro-

duction to Mr. Rigby, the Assistant Resident Justice there, to whom we are indebted for various courtesies. Watling's Island is about twelve miles long and six miles wide and a considerable part of its area is occupied by salt-water lakes or lagoons which have no obvious connection with the ocean. The bottoms of these shallow salt lakes are clothed with enormous quantities of the siphonaceous green algæ, *Batophora Oerstedi* and *Acetabulum crenulatum*. *Chara Hornemanni* is also common. As you and Dr. Millspaugh spent four days last March in this western and northern part of Watling's Island, we did not attempt to collect the land-plants here so thoroughly as we might have done otherwise ; nevertheless, specimens were taken rather freely and the results seem to justify the trouble, as certain species were found in better condition for collecting in November than they had been in the previous March. The following day, the twenty-sixth, was spent in the vicinity of Graham's Harbor, near the northeastern extremity of the island, not far from the monument on the eastern shore marking the spot where Christopher Columbus is supposed to have "first set foot upon the soil of the New World." Returning on the evening of the same day to Cockburn Town, we proceeded the next morning to the southeastern end of the island, a part which was not visited by the expedition of last spring. Four days, accordingly, were spent here and extensive collections were made. A plant of special interest here was *Euphorbia vaginulata* Griseb., which was quite common on the sands a short distance back from the coast. This was for many years known only from the Turk Islands, where it was obtained in 1858 by J. A. Hjalmarson, who spent fourteen days there in collecting materials which were used by Grisebach in preparing his "Flora of the British West Indian Islands." The plant is now well represented in our herbarium, having been taken by Mr. Nash and Mr. Taylor on Great Inagua and Little Inagua in 1904 and by them also in the type locality in 1905. It was found by us also at South Caicos and on Castle Island. Growing in the sand back from the shore, this species of *Euphorbia* develops into a shrub with a height of from one to nearly three feet, but occurring, as it sometimes does, on exposed littoral

rocks, it becomes dwarfed and more or less prostrate and appressed, as may be seen in the accompanying illustration (Fig. 10). A "creek" near the southeastern extremity of Watling's Island furnished some marine algæ of peculiar interest, including fertile specimens of *Halimeda tridens*, which are of exceedingly rare occurrence, having, in fact, been previously reported only from Porto Rico, where they were obtained by a New York

FIG. 10. *Euphorbia vaginulata* Griseb. (the low prostrate-appressed shrub) on white coral sea-cliffs, Long Cay, Cockburn Harbor, South Caicos.

Botanical Garden expedition in 1906. *Halimeda tridens* and *Halimeda Monile*, two closely related and occasionally confused species, were growing in great profusion and in most intimate association in this creek, yet showed no traces of intergrading forms.

From the southern end of Watling's Island, we sailed on the afternoon of November 30 for Atwood (Samana) Cay, a small island about eighty miles to the southeast, anticipating covering this distance by the following daybreak, but the wind shifted and

fell during the night and we did not reach the island until the morning of December 3. Atwood Cay is now uninhabited except at certain seasons, when small parties from the neighboring islands visit it in order to gather cascarilla bark, the bark of *Croton Eluteria*. This shrub is still fairly common at certain localities on this island, but in view of the rate at which it is now being uprooted, it seems only a question of a short time when the species will become very scarce. Atwood Cay, we believe, had never been visited by botanists before and the marine flora in particular we found of much interest, including several forms which we think will prove new to science; but up to this time we had suffered considerable delay owing to head winds and calms, so on the morning of December 5, after a stop of only two days, we took advantage of a brisk fair wind and set sail for the island of Mariguana, and the intervening distance of fifty-three miles was compassed in about five hours. We had planned to stop a day or more in the neighborhood of Betsy Bay at the northwest end of the island, where the soil is said to be especially good, but with the wind then prevailing it was not advisable to launch a boat or to anchor at this point, so we skirted the more sheltered south shore until about ten miles west of Abraham Bay, where we dropped anchor. Mariguana is nearly twenty-eight miles long and has a maximum width of six or seven miles. Its highest elevation is given on the charts as 101 feet. This island, like Atwood Cay, had not previously been visited by botanical collectors, so far as our information goes, and we accordingly devoted a week to exploring the southern and western parts of the island. The isolation and scanty population of Mariguana make it an attractive resort for various kinds of birds, of which the most showy and perhaps the most interesting is the red flamingo. A flock of between one hundred and two hundred of these picturesque birds was at the time of our visit dividing its attention between a shallow salt-pond at the eastern end of the island and the almost equally shallow bay or reef-harbor adjacent. Owing to a long-continued drought, many of the plants in this region were in a badly dried-up condition and scarcely suitable for the herbarium, yet nearly seven

hundred specimens of flowering plants were secured while we were on this island. In certain rocky areas, the cacti were well represented, and of these one of the most peculiar and striking was the Turk's-head cactus, the plant from which the Turk Islands, about one hundred and twenty miles further southeast, are said to have derived their name. Several living specimens of this cactus were obtained for the conservatories. The photograph (Fig. 11) reproduced herewith illustrates the odd form

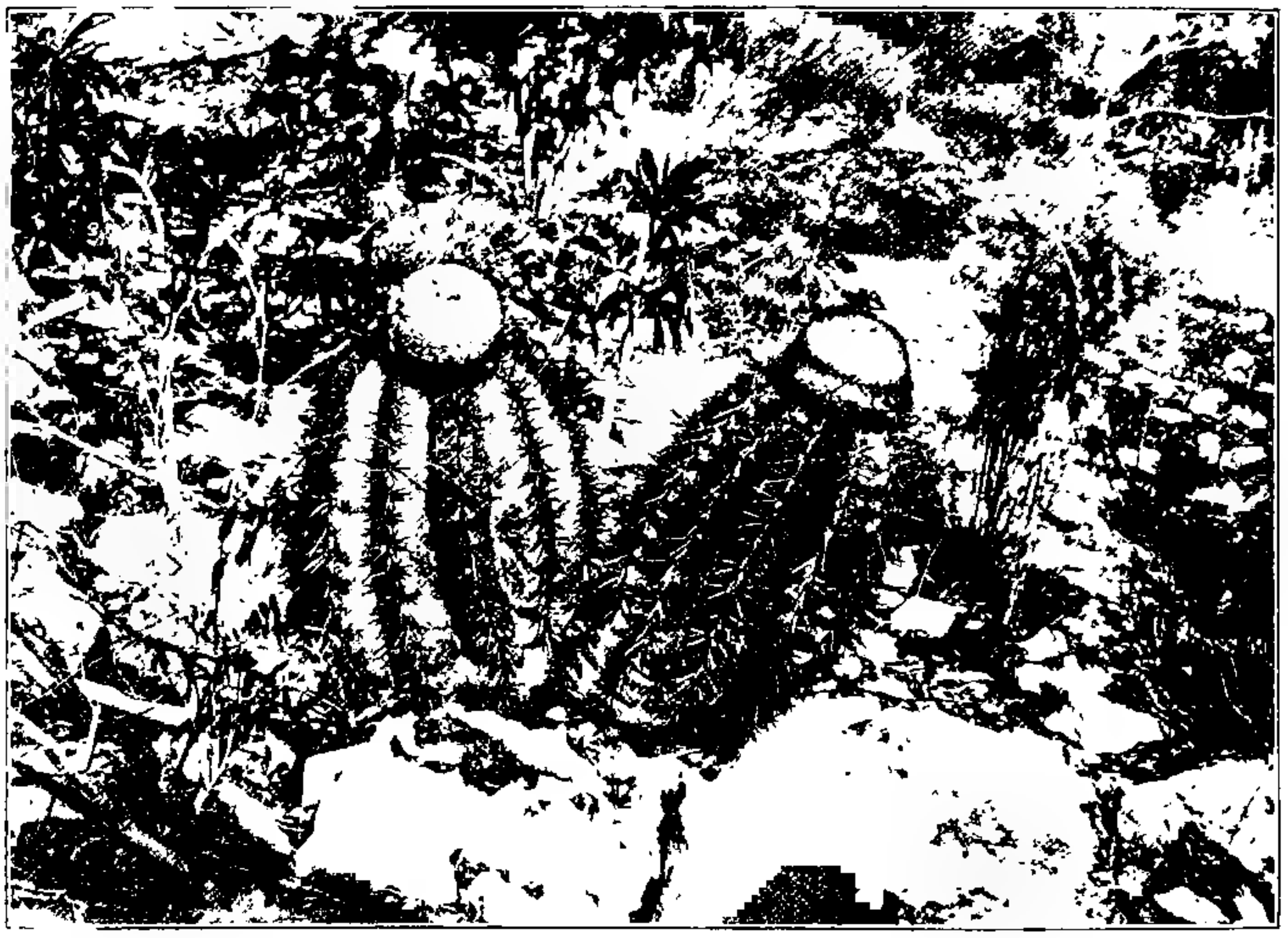

FIG. 11. The "Turk's-head cactus" (*Melocactus* sp.) on the island of Mariguana.

assumed by this plant. The hog-palm (*Pseudophoenix Sargentii*) appeared to be represented at the southeast end of Mariguana by a single specimen, less than six feet high.

On December 12, we sailed from Mariguana for the Caicos Islands, arriving at the port of entry, Cockburn Harbor ("East Harbor"), South Caicos, a little after noon on the fourteenth. South Caicos is only about twenty miles from the island of Grand Turk and it shares with the Turk Islands the fame of producing salt of an excellent quality. It is situated in longitude 71° 30′ and latitude about 21° 30′, and was the most southern and most

easterly of the islands visited on this expedition. We remained here from the fourteenth to the night of the sixteenth and collected many interesting plants not found on the other islands, including the Jamaican lignum-vitae, *Guaiacum officinale*, a species which, we believe, has not hitherto been reported from the Bahamas. Cockburn Harbor also furnished us numerous algae of interest.

During our stay at South Caicos, we heard much of the richness of the flora of the neighborhood of the settlement known as Kew, on the island of North Caicos, some forty or fifty miles to the northwest by a direct line, though considerably further by the "outside" or "ocean" route which our schooner was obliged to take in order to reach it. Late in the afternoon of the seventeenth we anchored off Fort George Cay and Pine Cay, at the western end of the island of North Caicos. Pine Cay takes its name from the presence of *Pinus caribaea*, which is fairly common there, though the trees are mostly small, the larger ones having been cut for lumber. It was the first time that we had met with the pine on the present voyage, although the tree is found in considerable abundance on the larger northern and western islands of the Bahamian group, at least on Andros, Great Bahama, Abaco, and New Providence. Arrangements having been made for a visit to Kew, one of our party (Mr. Wilson) started for that point at daybreak of the eighteenth in a small boat, accompanied by two natives and the first mate of the "Nellie Leonora." The distance from our anchorage to Kew Landing was about four miles, and, the route lying over a part of the shallow northern border of the Caicos Bank, a considerable portion of the trip was accomplished by pushing the boat along with a pole. The landing was reached at about ten o'clock and after following a trail for nearly three miles, we sighted the settlement of Kew, where our visit was evidently of as much interest to the inhabitants as the plants found there were to us. The tree locally known as the "oak" (*Bucida Buceras*) here attains a large size, excellent examples of it growing along the main thoroughfare of the village. Owing to the richness of its soil and consequent development of its vegetation, North Caicos was by far the most

interesting of the islands visited during the voyage. Some species of woody plants which are shrubs on the other islands here attain the size of trees. A more thorough exploration of this region at some future time would undoubtedly yield results of much scientific value. We were obliged to return to our schooner late in the afternoon of the same day, wading a part of the distance over banks that had been left nearly dry by the ebbing tide.

On the nineteenth a stop of a few hours was made on the the island of Providenciales, in the vicinity of Malcolm Road; good collections of marine algae were made here, but little was accomplished in the way of securing land-plants owing to the dryness of the region. The following day was devoted to exploring the the island of West Caicos. A large portion of this island is under cultivation and its flora, probably for that reason, seemed rather less varied and rich than that of some of the other islands of the Caicos group. There is a large plantation here for the cultivation of sisal (*Agave sisalana*), the property of a London company incorporated under the name of "Pita Ltd." About 1,600 acres are fully planted with sisal, over 1,400 acres are partially laid out and planted, and 700 acres in addition are now being cleared and burned over. An interior salt lake or pond contained several algae of particular interest, one of them being the plant that has commonly been identified with *Valonia aegagropila*, originally described from the lagoons of Venice, where it is said to be very abundant. This *Valonia* was common and luxuriant in this lake on West Caicos, often forming unattached hollow globose masses, sometimes attaining the size of a man's head. While at West Caicos we enjoyed the hospitality of the manager of the estate of the Pita company, Captain Henry T. W. Holdsworth, and his accomplished wife, and we are much indebted to Captain Holdsworth for assistance and helpful suggestions in our investigations of the flora of the island.

A part of December 21 was spent at Little Inagua, which was explored for the Garden by Mr. Nash and Mr. Taylor in 1904, and on the afternoon of the following day, we went ashore for a few hours on Castle Island, near the south end of Acklin's Island, while on our way to the Ragged Islands group, which we reached

on the afternoon of December 23. We remained at Great Ragged Island until the morning of December 27, making good collections there both of the seed-plants and of the algae, including several additions to the known flora of the Bahamian archipelago. A low gray fine-branched shrubby plant of rather striking appearance found there is a member of the morning-glory family, *Evolvulus bahamensis*, recently described as a new species by

FIG. 12. *Evolvulus bahamensis* House (in foreground), Great Ragged Island.

Mr. Homer D. House. Our photograph (Fig. 12) gives some idea of its habit of growth. During our stay at Great Ragged Island we were the recipients of various helpful favors from the Resident Justice, Mr. Stevenson, to whom we carried a letter of introduction from Hon. Herbert A. Brook, of Nassau, Registrar of the Colony.

From the Ragged Islands we headed northward for the return to Nassau, spending a few hours on the twenty-eighth on Harvey's Cay of the Exuma Chain and the morning of the next day on Rose Island, a few miles northeast of New Providence. Nassau

was reached on the afternoon of the twenty-ninth and the following three days were devoted to packing for the voyage to New York, where we arrived on January 5. The algae secured on the expedition are represented by 830 collection-numbers and the seed-plants by 741 numbers, the total doubtless aggregating over 8,000 herbarium specimens. In addition, a considerable amount of museum material was obtained. The living plants collected, representing particularly the Cactaceae, were left in the care of Mr. L. J. K. Brace, of Nassau, to await a more favorable season for shipment to New York.

Respectfully submitted,

MARSHALL A. HOWE,

PERCY WILSON.

SPRING LECTURES, 1908.

Lectures will be delivered in the lecture hall of the museum building of the Garden, Bronx Park, on Saturday afternoons, at 4:00 o'clock as follows:

May 2. "A Botanical Expedition to Jamaica and Cuba," by DR. ARTHUR HOLLICK.

May 9. "Early-Flowering Trees and Shrubs," by DR. N. L. BRITTON.

May 16. "Plant Life of the Sea," by DR. M. A. HOWE.

May 23. "Ornamental Shrubs; Their Selection and Arrangement," by MR. GEORGE V. NASH.

May 30. "Plants that Feed on Insects," by DR. C. STUART GAGER.

June 6. "Adulterants in Foods and Drugs and their Detection," by DR. H. H. RUSBY.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5:28 train from the Botanical Garden Station, arriving at Grand Central Station at 5:57 P. M.

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedfork Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Steet and Third Avenue.

NOTES, NEWS AND COMMENT.

Dr. and Mrs. N. L. Britton and Dr. Arthur Hollick sailed for Kingston, Jamaica, on February 22. They have planned to make collections at the western end of the island, and a Bahamian schooner has been chartered for this purpose. It is expected that a stop will be made in eastern Cuba on the return voyage early in April.

Some interesting and very successful experiments with color photography were recently made in the conservatories of the Garden by Mr. F. C. Berte.

Twenty-five sets of duplicate polypores, representing nearly a hundred of our more common species, have recently been sent out by the Garden to certain botanical institutions in the eastern United States and Europe.

Vol. 9, part 2, of the North American Flora, appeared March 12, 1908. This part concludes the treatment of the polypores, and contains most of the large tree-destroying fungi of special interest to foresters.

An attractive Philippine shrub, *Medinilla magnifica*, described and figured in the JOURNAL for July, 1907, is now in flower in the public conservatories, house no. 4.

The seedling of *Tumboa Bainesii*, described in the October number of the JOURNAL, has made considerable growth since that time. By reference to the lower figure there shown it may be seen that the leaves which are eventually to be the permanent ones are considerably shorter than the cotyledons. Now they are at least three eighths of an inch longer than the seed leaves. The only other change of note is the flesh color that has gradually come over the whole plant; but as yet there is nothing that gives one a hint as to the remarkable adult form that it is hoped the plant may some day attain.

Among the cyclamens represented in the conservatories, *Cyclamen Neapolitanum* has a very curious arrangement of its seed pods. After the flower has dropped off, the stalk with the immature fruit begins to spirally contract, so that when the seed is ready to be discharged the pod is tightly held in a closely coiled spiral which

is capable of considerable movement when rolled over the ground by the wind or other agencies. A specimen of this plant at the conservatories now presents all stages of this interesting process.

Meteorology for February. — The total precipitation recorded for the month was 5.45 inches, including snow-falls of 7 inches on the 6th, 5 inches on the 19th, and traces of snow on the 16th and 26th. Maximum temperatures were recorded of 46° on the 1st, 44° on the 6th, 51° on the 11th, 40° on the 17th, and 46° on the 27th; also minimum temperatures of 0.5° on the 5th, 11° on the 11th, 13° on the 23d, and 11° on the 25th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM JANUARY 1 TO FEBRUARY 29, 1908.

BROWN, STEWARDSON. *Alpine flora of the Canadian Rocky Mountains.* New York, 1907. (Given by the author.)

COLE, GEORGE WATSON. *Bermuda in periodical literature.* [Boston], 1907. (Given by the author.)

CURTIS, CARLTON CLARENCE. *Nature and development of plants.* New York, 1907. (Deposited by the trustees of Columbia University.)

FITCH, WALTER HOOD, & SMITH, WORTHINGTON GEORGE. *Illustrations of the British flora.* London, 1880. (Given by Mr. F. Weinberg.)

GRISEBACH, AUGUST HEINRICH RUDOLPH. *Flora of the British West Indian Islands.* London, 1859–64. (Given by Dr. Margaret B. Wilson.)

Illinois State Agricultural Society. Transactions. Vols. 5, 25. Springfield, 1865, 1889. 2 vols.

Illinois State Horticultural Society. Transactions. New ser. Vols. 21–22. Warsaw, 1888–89. 2 vols.

Iowa State Agricultural Society. Report for 1863–64, 1868–69, 1874–75. Des Moines, 1864–76. 6 vols.

JORDAN, DAVID STARR. *Fishes.* New York, 1907. (Given by Dr. N. L. Britton.)

Kansas State Board of Agriculture. Report for 1875. Topeka, 1875.

LOW, ALBERT PETER. *Report on the Dominion government expedition to Hudson Bay and the arctic islands on board the D. G. S. Neptune 1903–1904.* Ottawa, 1906. (Given by Mr. J. M. Macoun.)

Massachusetts Board of Agriculture. Synoptical and analytical index, 1837–92. Boston, 1893.

MIGULA, WALTER. *Kryptogamen-Flora von Deutschland, Deutsch-Österreich und der Schweiz* Band II., Algen. 1 Teil. Gera, R., 1907.

VIDAL Y SOLER, SEBASTIAN. *Phanerogamae Cumingianae philippinarum.* Manila, 1885.

Wisconsin State Agricultural Society. Transactions. Vol. 7. Madison, 1868.

Wisconsin State Horticultural Society. Transactions. Vol. 12. Madison, 1882.

MUSEUM AND HERBARIUM.

104 specimens of flowering plants from British America. (By exchange with the Geological Survey of Canada.)

2 specimens of flowering plants from Indiana. (Given by Professor J. C. Arthur.)

2 museum specimens of bark and sap of the Cow Tree from Venezuela. (Given by Mr. F. F. von Wilmousky.)

1 specimen of yam root. (Given by Dr. H. H. Rusby.)

6 specimens of drugs and spices. (Given by Dr. H. H. Rusby.)

116 specimens of flowering plants from Nevada. (By exchange with Professor P. B. Kennedy.)

230 museum specimens of marine algae from the Bahamas. (Collected by Dr. M. A. Howe.)

240 specimens of flowering plants from Barbados, West Indies. (Collected by Mr. J. S. Dash.)

6 specimens of violets from South Carolina. (By exchange with Mr. H. D. House.)

6 specimens of ferns from eastern North America. (Given by Miss Margaret Slosson.)

10 specimens of mosses from North Carolina. (Given by Dr. A. J. Grout.)

140 specimens of mosses and hepatics from Guadeloupe. (Collected by Rev. Père Duss.)

2 specimens of mosses from Guatemala. (By exchange with the U. S. National Museum.)

60 specimens "Musci Americae Septentrionalis Exsiccati." (Distributed by Mr. J. Cardot.)

7 specimens of mosses from Georgia. (By exchange with Professor J. F. Collins.)

20 specimens of polypores from Delaware. (By exchange with the Delaware Agricultural Experiment Station.)

2 specimens of *Gloeophyllum* from the eastern United States. (By exchange with the U. S. Department of Agriculture.)

149 specimens of fleshy fungi from Massachusetts. (Given by Mr. Geo. E. Morris.)

1 package of "Koffeno." (Given by the Sleepy Eye Milling Company.)

3 specimens of drugs. (Given by Dr. H. H. Rusby.)

1 specimen of fruits of the Stone Pine. (Given by Dr. H. H. Rusby.)

35 specimens of marine algae from the Danish West Indies. (By exchange with Mr. F. Börgesen.)

PLANTS AND SEEDS.

1 plant for conservatories. (Given by Miss Helen M. Gould.)

2 plants for conservatories. (Purchased.)

5 plants for conservatories. (Given by Mr. C. Wercklé.)

3 plants for conservatories. (By exchange with Department of Parks, Borough of Brooklyn.)

1 plant for conservatories. (Given by Mr. Oakes Ames.)

2 plants from Mexico for conservatories. (By exchange with United States National Museum, through Dr. J. N. Rose.)

1 root for conservatories. (Given by Dr. H. H. Rusby.)

1 packet of seed. (Given by Dr. H. H. Rusby.)

14 packets of seed from Costa Rica. (Given by Mr. C. Wercklé.)

1 packet of seed from Jamaica. (By exchange with Public Gardens, Jamaica.)

33 packets of seed from North Carolina. (Collected by Mr. W. W. Eggleston.)

1 packet of seed from Sonora. (By exchange with the United States National Museum, through Dr. J. N. Rose.)

1 packet of seed from Bronx Park. (Collected by Mr. R. C. Schneider.)

28 plants derived from seed from various sources.

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Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations carried out in the Garden. Free to all members of the Garden; to others, $3.00 per volume. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Vol. II, Nos. 6–8, 518 pp., 30 plates, 1901–1903. Vol. III, Nos. 9–11, 463 pp., 37 plates, 1903–1905. Vol. IV, Nos. 12–14, 479 pp., 14 plates, 1905–1907. Vol. V, No. 15, 105 pp., 1906; No. 16, 88 pp., 17 plates, 1906; No. 17, 115 pp., 1907. Vol. VI, No. 19, 114 pp., 1908.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies and Central America. Planned to be completed in thirty volumes. Roy. 8vo. Each volume to consist of four or more parts. Subscription price $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Vol. 22, part 1, issued May 22, 1905, contains descriptions of the order Rosales by Dr. J. K. Small, and of the families Podostemonaceae by Mr. Geo. V. Nash, Crassulaceae by Dr. N. L. Britton and Dr. J. N. Rose, Penthoraceae and Parnassiaceae by Dr. P. A. Rydberg.

Vol. 22, part 2, issued December 18, 1905, contains descriptions of the families Saxifragaceae and Hydrangeaceae by Dr. J. K. Small and Dr. P. A. Rydberg; the Cunoniaceae, Iteaceae and Hamamelidaceae by Dr. N. L. Britton; the Pterostemonaceae by Dr. J. K. Small; the Altingiaceae by Percy Wilson and the Phyllonomaceae by Dr. H. H. Rusby.

Vol. 7, part 1, issued Oct. 4, 1906, contains descriptions of the families Ustilaginaceae and Tilletiaceae, by Professor G. P. Clinton.

Vol. 7, part 2, issued March 6, 1907, contains descriptions of the families Coleosporiaceae, Uredinaceae and Aecidiaceae (pars), by Professor J. C. Arthur.

Vol. 25, part 1, issued August 24, 1907, contains descriptions of the family Geraniaceae by Miss L. T. Hanks and Dr. J. K. Small, the Oxalidaceae and Linaceae by Dr. J. K. Small, and the Erythroxylaceae by Dr. N. L. Britton.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908, contains descriptions of the Polyporaceae, by Dr. W. A. Murrill.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg, assistant curator of the museums. An arrangement and critical discussion of the Pteridophytes and Phanerogams of the region with notes from the author's field book, including descriptions of 163 new species. ix + 492 pp. Roy. 8vo, with detailed map.

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Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume.

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Vol. IV. Nos. 76–100, vi + 444 pp. 65 figures in the text, 2 maps, 3 diagrams and 29 plates.

RECENT NUMBERS 25 CENTS EACH.

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JOURNAL

OF

The New York Botanical Garden

EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

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JOURNAL

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The New York Botanical Garden

VOL. IX. April, 1908. No. 100.

REGISTERED INVESTIGATORS AT THE NEW YORK BOTANICAL GARDEN, 1897–1908.

ABRAMS, LEROY, Stanford Univ, Calif. b. Sheffield, Ia, Oct. 1, 74. Stanford, A.B, 99, A.M, 02; Columbia (fel.) and **N. Y. Bot. Garden, 04–05; research sch, N. Y. Bot. Garden, 05.** Act. prof. bot, Idaho, 99–00; asst. syst. bot, Stanford, 00–02; instr, 02–04; asst. curator, Div. Plts, U. S. Nat. Mus, 05; *asst. prof. bot, Stanford, 06–.* A. A. A. S; Nat. Geog. Soc; Wash. Bot. Soc; Wash. Biol. Soc; Torrey Bot. Club.

Taxonomy.

ANDERSON, MARY PERLE, Horace Mann School, N. Y. C, and East Berkshire, Vt. b. East Berkshire, Vt, June 9, 64. Mt. Holyoke, B.S, 90; Mass. Inst. Tech, 97–98; Woods Hole, 99; Chicago, 02–04; Columbia and ***N. Y. Bot. Garden, 06-08;*** Kew, and Jardin des Plantes (Paris), 07. Tea. sci, K. C. L. College (Independence, Mo.), 90–94; tea. sci, Plymouth (Mass.) H. S, 94–95; instr. biol, Somerville (Mass.) H. S, 95–02; instr. nat. study, Vermont State summer schools, 02, 04, 05; instr. biol. and nat. study, summer session, Columbia, 03; instr. bot, Mt. Holyoke, 04–06; *critic tea, biol. and nat. study, Tea. Coll, Columbia, 07–.* 1st Stokes prize essay, Wild Flower Pres. Soc. Am, 04. Am. Nat. Study Soc.

Geographical distribution of the ferns of Japan.

ARTHUR, JOSEPH CHARLES, Lafayette, Ind. b. Lowville, N. Y, Jan. 11, 50. Iowa State, B.S, 72, M.S, 77; Hopkins, 78–79; Harvard, 79; Cornell, Sc.D, 86; Bonn, 96; **N. Y. Bot. Garden,**

03, 04, research sch, 06, 07, 08. Instr. bot, Minnesota and Wisconsin, 79–82; bot. Exp. Sta, Geneva, N. Y, 84–87; *prof. veg. physiol. and path, Purdue, 87–; bot, Ind. Exp. Sta, 88–;* Int. Cong. Arts and Sci, St. Louis, 04 (speaker); Internat. Bot. Cong, Vienna, 05 (del. Smith. Inst.). Fel. A. A. A. S (sec'y, Sec. F, 86; asst. gen sec'y, 87; v.-pres, 95); Bot. Soc. Am. (pres, 02); Soc. Prom. Agric. Sci; fel. Ind. Acad. Sci, (pres, 93); Iowa Acad. Sci; Wash. Acad. Sci; Phila. Acad. Sci; Torrey Bot. Club; Int. Assoc. Bot.

Mycology; fungus diseases of cultivated crops; development of plant rusts.

BAILEY, HARRIET BROWN, N. Y. City. Deceased, Nov. 25, 05. **N. Y. Bot. Garden, 02–04.** Wild Flower Pres. Soc. Am.

BANKER, HOWARD JAMES, De Pauw Univ, Greencastle, Ind. b. Schaghticoke, N.Y, April 19, 66. Syracuse, A.B, 92; Columbia, A.M, 00, Ph.D, 05; **N. Y. Bot. Garden, 99–00, 02, 03–04, 05, 06.** Instr. biol, S. West. Nor. Sch, California, Pa, 10–04; *prof. De Pauw, 04–.* Fel. A. A. A. S; Bot. Soc. Am; Torrey Bot. Club.

Mycology.

BANTA, MAY, Wellesley, B.S, 89; **N. Y. Bot. Garden, 99–00.**

BARNHART, JOHN HENDLEY, 34 Windle Park, Tarrytown, N.Y. b. Brooklyn, N. Y, Oct. 4, 71. Wesleyan, A.B, 92, A.M, 93; Columbia, M.D, 96; **N. Y. Bot. Garden, 01–03.** ***Ed. asst, N. Y. Bot. Garden, 03–, librarian, 07–.*** Fel. A. A. A. S; Am. Soc. Nat; Torrey Bot. Club, (editor-in-chief, 03–07); N. Y. Bot. Garden, (life mem.); Biol. Soc. Wash.

Botanical bibliography and nomenclature; taxonomy of flowering plants; local floras of North America.

BARRETT, ALICE IRENE, Deceased. **N. Y. Bot. Garden, 00–01.**

BARRETT, MARY FRANKLIN, Wellesley College, Wellesley, Mass. b. Bloomfield, N. J, August 25, 79. Smith, B.L, 01; Barnard, 01–02; Woods Hole Marine Biol. Lab, 02; Columbia and **N. Y. Bot. Garden, 03–06;** Columbia, A.M, 05; Cornell, summer session, 06. Tea, H. S, Verona, N. J, 04; tea. sci. and math, Randolph-Pond Sch, N. Y. C, 05–06; *instr. bot. Wellesley, 06–.* Torrey Bot. Club.

Taxonomy of fungi.

BATESON, CHARLES EDWARD WAGSTAFFE, 145 West 58 St, N. Y. C. Columbia, E.M, 02, A.M, 05 ; **N. Y. Bot. Garden, 04–05.**

Paleobotany.

BENEDICT, RALPH CURTIS, N. Y. Bot. Garden, N. Y. C. b. Syracuse, N. Y, June 14, 83. Syracuse, A.B, 06. Asst. biol, Syracuse, 05–06 ; ***student and aid, N. Y. Bot. Garden, 06–.***

Taxonomy of pteridophytes.

BILLINGS, ELIZABETH, 279 Madison Ave, N. Y. C. b. Woodstock, Vt, 71. Barnard (spec. student), 95 ; **N. Y. Bot. Garden, 02–03, 04, 05, 06, 08–.** N. Y. Acad. Sci. (life mem.) ; Torrey Bot. Club ; N. Y. Bot. Garden (life mem.).

Paleobotany, Taxonomy.

BLODGETT, FREDERICK H, College Park, Md. b. Rockford, Ill, Sept. 12, 72. Rutgers Coll, B.S, 97 ; M.S, 99 ; **student and aid, N. Y. Bot. Garden, 00–01 ;** asst. curator (botany), Field Columbian Mus, 01 ; asst. State Path, Maryland Agric. Coll, 01–06 ; *grad. student-asst. bot, Johns Hopkins, 06–.* Fel. A. A. A. S.

Embryology and Ontogeny.

BRACKETT, MARY M. 604 W. 115 St, N. Y. C. N. Y. C. Nor. Coll. 93 ; **N. Y. Bot. Garden, 04.** *Sec'y Wadleigh H. S. (N. Y. C.), 05–;* asst. ed, Plant World, 06–. Torrey Bot. Club. A. A. A. S.

BRAISLIN, ANNA PRISCILLA, (Mrs. Thomas H. Montgomery, Jr.). Vassar, A.B, 97 ; Univ. of Penn, Philadelphia ; **N. Y. Bot. Garden, 99–00.**

BRANDENBURG, ELLEN KLAPP, 915 French St, Washington, D. C. b. Philadelphia, Pa, 82. Columbian, B.S, 04 ; Harvard Summer Sch, 03 ; Cold Spring Harbor, 05 ; Cornell Summer Sch, 06 ; ***N. Y. Bot. Garden, 07–.*** Instr. in biol. and english, Washington H. Schs, 04–07.

Botany ; mycology.

BROADHURST, JEAN, Teachers College, Columbia Univ, N. Y. C. b. Stockton, N. J, Dec. 29, 73. N. J. State Nor. Sch. (Trenton), 92 ; Tea. Coll. Columbia, B.S, 03 ; **N. Y. Bot.**

Garden, 01–02. Asst. bot, Barnard Coll, 02–03; tea. N. J; State Nor. Sch, 03–06; *instr. biol, Tea. Col, 06–.* A. A. A. S. Torrey Bot. Club; Wild Flower Pres. Soc. Am. (2nd Stokes) prize essay, 04); Nat. Study Soc. *Editor, Torreya, 08–.*

Morphology.

BROOMALL, LAURA BAKER. Michigan, B.S, 98; **N. Y. Bot. Garden, 03.**

Embryology of spermatophyta.

BRUCKMAN, LOUISE, 1022 Lexington Ave, N. Y. C. b. New York, March 16, 72. N. Y. C. Nor. Coll, 87–91; N. Y. C. Nor. Coll, Pd.B, 95; N. Y. Univ, Pd.M, 95; B.S, 07; Cornell Summer Sch, 99; Cold Spring Harbor, 00, 01, 03; **N. Y. Bot. Garden, 00–01.** Tea, elementary Schools of N. Y. C, 92–02, *instr. biol, Girls' H. S. Brooklyn, N. Y. 02–.* Torrey Bot. Club.

Pedagogy of biology.

BRUES, CHARLES THOMAS, Milwaukee Public Museum, Milwaukee, Wis. b. Wheeling, W. Va, June 20, 79. Univ. Texas, B.S, 01, M.S, 02; **N. Y. Bot. Garden, 02–03;** fel. zool, Columbia, 02–03; Scholar zool, Columbia, 03–04. Special field agent, U. S. Dept. Agric, 04–05; member of staff, Marine Biol. Lab. Woods Hole, Mass, 03; *curator invert. zool, Milwaukee Pub. Mus, 05–.* Wisconsin Nat. Hist. Soc. (gen. sec'y, and ed. of their Quarterly Bull.); Sigma Xi; Washington Entomol. Soc; Entomol. Soc. Am; Assoc. Economic Entomol; fel. A. A. A. S; Wisconsin Acad. Scis, Arts and Letters.

Morphology of algae.

BYRNES, ESTHER FUSSELL, 193 Jefferson Ave, Brooklyn, N. Y. b. Philadelphia, Pa, Nov. 3, 67. Bryn Mawr, A.B, 91, A.M, 94, fel, 94–95, Ph.D, 98; Woods Hole, 91; **N. Y. Bot. Garden, 02–03,** Demonstr. biol, Vassar, 91–93; Bryn Mawr, 95–97; *tea. biol, Girls' H. S, Brooklyn, 98–.* Am. Soc. Nat; Mar. Biol. Assoc; fel. N. Y. Acad. Sci; N. Y. Assoc. Biol. Teas. (v. pres.).

Cytology, Zoology, Experimental morphology.

BUDINGTON, ROBERT ALBYN. Williams, A.B, 96, A.M, 99; **N. Y. Bot. Garden.**

BURLINGHAM, GERTRUDE SIMMONS, N. Y. Bot. Garden, N. Y.

C. b. Mexico, N. Y, April 21, 72. Syracuse, A.B, 96; Woods Hole, 99; **N. Y. Bot. Garden** and Columbia, **05–08.** Preceptress, Ovid (N. Y.) Union Sch, 98; tea. biol. sci, Binghamton (N. Y.) H. S, 98–05; *instr. biol. N. J. State Nor. Sch, Trenton, 08–.*

Biology, Mycology, Plant Physiology.

BUTLER, BERTRAM THEODORE, Helena, Mont. b. Nashua, Ia, March 22, 72. Hamline Univ, Ph.B, 01; *grad. stud, Columbia, 07–*; ***N. Y. Bot. Garden, 07–.*** Tea, elementary and High Schs, 90–98; instr. Sci, Montana Wesleyan Univ, Helena, Mont, 03-05; city supt. schs. and sci. tea, High Sch, Glendine, Mont, 05–07.

Regional botany.

CANNON, WILLIAM AUSTIN, Tucson, Ariz. b. Washington, Mich, Sept. 23, 70. Stanford, A.B, 99, A.M, 00; fel. Columbia, 00–02, Ph.D, 02. Asst. in bot, Stanford, 99–00; **lab. asst, N. Y. Bot. Garden, 02–03, (Carnegie fel.) 06;** ; resident investigator, Desert Bot. Lab, Carnegie Inst, Tucson, Ariz, 03-05; *member of staff, Dept. of Bot. Research, Carnegie Inst, 03–.* Fel, A. A. A. S; Bot. Soc. Am; Nat. Geog. Soc; Am. Forestry Assoc.

Structure of plant hybrids, biology of desert plants.

CARDIFF, IRA DIETRICH, Salt Lake City, Utah. b. Goshen Tp, Stark Co, Ill, June 20, 73. Knox, B. S, 97; Chicago, 99–04; Columbia, Ph.D, 06; **N. Y. Bot. Garden, 04–05, (research sch.) summer, 06.** Asst. bot, Col. Univ, 04–07; *prof. bot. Univ. Utah, 06–.* A. A. A. S.

Morphology and cytology.

CARSS, ELIZABETH. Cornell, Ph.B, 95; **N. Y. Bot. Garden, 00–01.**

CLARK, ANNA MAY, Training School for Teachers, 241 East 119 St, N. Y. C. b. Brookfield, Vt, April 21, 74. State Nor. Sch, New Britain, Conn, 96; Vermont, Ph.B, 98; Tea. Coll, Columbia, Masters diploma, 04; **N. Y. Bot. Garden, 03–04;** Columbia, M.A, 04. Tea. sci, State Nor. Sch, New Britain, Conn, 98–99; tea. sci, State Nor. Sch, Framingham, Mass, 99–

03 ; tea. sci. and nature study, N. Y. C. Training Sch. for Teas, 04–07 ; *first asst. and head of dept, 07–.*

Biology, botany and nature study.

CLEMENTS, FREDERIC EDWARD, Univ. of Minnesota, Minneapolis, Minn. b. Lincoln, Nebr, Sept. 16, 74. Nebraska, B.S, 94, A.M, 96, Ph.D, 98 ; **N. Y. Bot. Garden, 02.** Asst. bot, Nebraska, 94–97, instr, 97–01, adj. prof, 01–03, asst. prof, 03–05, assoc. prof. plt. physiol, 05–06 ; prof, 06–07 ; *prof. bot, Minnesota, 07–.* Sec.'y, Nebr. Bot. Surv, 94– ; fel, A. A. A. S ; Bot. Soc. Am ; Geog. Assoc ; Bot. Cent. States ; Micros. Soc ; Mycol. Soc.

Phytoecology.

CLEMENTS, MRS. F. E. (See Schwartz, Edith)

COKER, WILLIAM CHAMBERS, Chapel Hill, N. C. b. Hartsville, S. C, Oct. 24, 72. S. Carolina, B.S, 94 ; Hopkins, Ph.D, 01 ; Bonn, 01–02 ; **N. Y. Bot. Garden, 05, 07.** Asst. bot, Cold Spring Harbor, 00 ; *assoc. prof. bot, No. Carolina, 02– ;* chief of bot. staff, Bahama Exped. of Baltimore Geog. Soc, 03. Fel, A. A. A. S ; Am. Soc. Nat ; Bot. Soc. Am ; N. C. Acad. Sci. (*v. pres, 07–*).

Cytology, embryology.

COOK, MELVILLE THURSTON, Agric. Exp. Station, Newark, Del. b. Coffeen, Ill, Sept. 20, 69. De Pauw, 88–89, 91–93 ; Stanford, A.B, 94 ; De Pauw, A.M, 01 ; fel, Ohio State, 01–02, Ph.D, 04 ; **N. Y. Bot. Garden (research sch.) 07.** Prin, H. S, Vandalia, Ill, 94–95 ; instr. biol, De Pauw, 95–97 ; prof, 97–04 ; lecturer human embryol. Central Coll. Physicians and Surgeons, Indianapolis, 02–03 ; comp. anat, Med. Coll. Ind, 03–04 ; chief, dept. plt. path. and econ. entom, Estación Central Agronomica de Cuba, Santiago de las Vegas, Cuba, 04–07 ; *prof. bot, Delaware Coll, and plt. path, Del. Agric. Exp. Sta, 07–.* Fel, A. A. A. S ; Assoc. Econ. Entomol ; Ind. Acad. Sci.

Embryology ; insect galls.

CRANE, AURELIA BLAIR, Scarsdale, N. Y. Barnard ; **N. Y. Bot. Garden, 04–05.** Torrey Bot. Club.

Mycology.

CUMMINGS, CLARA EATON, deceased, Dec. 28, 06. b. Plymouth, N. H, July 13, 55. Wellesley, 76–79; Zürich, 86–87; **N. Y. Bot. Garden (Cinchona), 05.** Instr. bot, Wellesley, 79–87, assoc. prof, 87–03, prof, 03–06. Chief Ed. "Decades of N. A Lichens," and "Lichenes Boreali"; assoc. ed. Plt. World, 05–06; fel, A. A. A.. S; Soc. Plt. Morph. and Physiol. (v. pres, 04); Mycol. Soc; Torrey Bot. Club; Bost. Soc. Nat. Hist; Bost. Mycol. Club; Wild Flower Pres: Soc. Am.

Lichenology.

DARLING, CHESTER A, Columbia Univ, N. Y. C. b. Leon, N. Y, Oct. 4, 80. Albion, A. B, 04, A.M, 06; **N. Y. Bot. Garden** and Columbia, **06–.** Prof. biol, Defiance Coll, Defiance, O, 04–06; *asst. bot. Columbia, 06–.* Ohio State Acad. Sci.

Cytology, Plant physiology.

DELAFIELD, MRS. JOHN ROSS (see White, Violette S.)

DOW, BERTHA MCLANE, 123 West 80 St, N. Y. C. b. New York City, June 3, 69. Barnard (spec. student), 95 (certificate), 01–02; **N. Y. Bot. Garden, 00–01;** Woods Hole, summer 06. Instr. sci, Park Avenue Sch, N. Y. C, 01–05; *instr. sci, The Alcuin Prep. Sch, N. Y. C, 05–.*

Biology, teaching.

DUFOUR, ALICE, Stockbridge Hall, Yarmouth, Maine. b. Gallipolis, O, Aug. 22, 63. Ohio State, 97–99; Defiance, Ph.B, 99; fel. and asst. bot, Ohio State, 99–00; **N. Y. Bot. Garden, 00–01, 02–03,** Columbia, A.M, 03; Directora, Escuela Practica de Señoritas, Guatemala City, Cent. Am, 05–07; *principal, Stockbridge Hall, Yarmouth, Me, 07–.* Ateneo, Guatemala City, Cent. Am.

Sociology, botany.

DUNN, LOUISE BRISBANE, deceased Dec. 18, 02. Columbia, A.B, 97, A.M, 99; **N. Y. Bot. Garden, 99–00.**

DURAND, ELIAS JUDAH, Cornell Univ, Ithaca, N. Y. b. Canandaigua, N. Y, Mch. 20, 70. Cornell, A.B, 93, Sc.D, 95. **N. Y. Bot. Garden (research sch.) 05.** Asst. bot. Cornell, and asst. crypt. bot. Agric. Exp. Sta, 95–96, *instr. bot. 96–; asst. curator herb. 98–.* Fell. A. A. A. S; Bot. Soc. Am; Sigma Xi.

Mycology, Discomycetes, Embryology.

EATON, ELON HOWARD, Rochester, A.B, 90, A.M, 93; **N. Y. Bot. Garden, 99–00.**

EGGLESTON, WILLARD WEBSTER, Rutland, Vt. b. Pittsfield, Vt, Mch. 28, 63. Dartmouth, B.S, 91; student, Gray Herb, 97; studying *Crataegus*, Biltmore Herb, 07–08; **N. Y. Bot. Garden (research sch.), 08.** Studying and collecting, local flora of Vermont, 91–04; asst. city engineer, Rutland, 93–97; civil engineering, 97–04; **aid, N. Y. Bot. Garden, 04–07;** *lecturer, civil engineering, Biltmore Forest Sch, 08–.* A. A. A. S; Vermont Bot. Club; N. E. Bot. Club; Thayer Sch, Civil Engineers (Dartmouth).

Taxonomy of *Crataegus*. Arctic-alpine flora of New England.

EMERSON, JULIA TITUS, 131 East 66 St, N. Y. C. b. N. Y C, April 6, 77. Coll. Pharm. (Columbia), 98; Tea. Coll, Columbia, 98–99; Woods Hole, 99, 01, 03, 04; Briarcliff Manor Agric. Sch, 01; ***N. Y. Bot. Garden, 02–04, 04–.*** Spec. asst, plt. path, Purdue, 02; **lab. asst, N. Y. Bot. Garden, 03–04.** Torrey Bot. Club; Wild Flower Pres. Soc. Am.

Taxonomy of Mosses.

EVANS, HELENA, 205 W. Court St, Rome, N. Y. Syracuse, Ph.B, 01. **N. Y. Bot. Garden, 06–07.**

Mosses.

FAWCETT, EDNA HAGUE, Dept. Agric. Washington, D. C. b. Washington, D. C, Feb. 26, 79. Smith, B.L, 01; Barnard, 02–03; **N. Y. Bot. Garden, 04–05;** tea. pub. schs, Springfield, Mass, 01–02; tea, primary work and nat. study, Miss Keller's Day Sch, N. Y. C, 02–05; *Sci. asst. Bur. Plant Industry, (Lab. Soil Bact. and Water Purif. Invest.) U. S. Dept. Agric., Wash, D. C, 06–.*

Soil bacteriology.

GAGER, CHARLES STUART, N. Y. Bot. Garden, N. Y. C. b. Norwich, N. Y, Dec. 23, 72. Syracuse, A. B, 95; N. Y. State Nor. Coll, Pd.B, Pd.M, 97; Cornell, Ph.D, 02. Lab. asst. biol. Syracuse, 94–95; v. prin, Ives Sem, (Antwerp, N. Y.), 95–96; prof. biol. sci. and physiog, N. Y. State Nor. Coll. (Albany), 97–05; asst. bot. summer sch, Cornell, 01, 02; instr, 05; col-

laborator, Jour. Applied Micros, 01–02; **lab. asst, N. Y. Bot. Garden, 04–05;** acting prof. bot, Rutgers, 05; prof. bot, N. Y. Univ. summer sch, 05, 06; tea. biol, Morris H. S, N. Y. C, 05; ***director of the laboratories, N. Y. Bot. Garden, 06-;*** assoc. ed. Plant World, 05. A. A. A. S; fel. Am. Geog. Soc, 05–06; N. Y. State Sci. Tea. assoc. (mem. Committee on Physiog.) 01–04; Albany Entom. Soc. (Chart. mem.) 98–04, (v. pres, 98–99); Torrey Bot. Club (*Sec'y, 05–*); Soc. Exp. Biol. & Med, (Charter mem.); Am. Soc. Biol. Chemists; Bot. Soc. Am; N. Y. Club, Phi Beta Kappa; Sigma Xi.

Plant physiology; cytology.

GAINES, ELIZABETH VENABLE, 297 Ryerson St, Brooklyn, N. Y. b. Mossingford, Va, Ap. 25, 69. Vassar, 89; Mass. Inst. Tech, 92–94; Chicago, 98; Adelphi Coll, B.A, 99; **N. Y. Bot. Garden, 02–03.** *Instr. biol, Adelphi Coll, 99–.*

Sanitary biology.

GARDENER, JOHN R, Upper Univ. Iowa (Fayette), B.S, 90; Iowa State, C.E, 94; **N. Y. Bot. Garden, 00, and at various times thereafter.**

Taxonomy of Celastraceae of N. A.

GILMAN, CHARLES WINTHROP, Palisades, N. Y. **N. Y. Bot. Garden, 00–01.**

Mosses.

GLEASON, HENRY ALLAN, Univ. of Illinois, Champaign, Ill. Illinois, B.S, 01, M.A, 04; Columbia, Ph.D, 06; **N. Y. Bot. Garden, 05–06.** *Instr. bot. Illinois, 06–.* A. A. A. S; Torrey Bot. Club.

Taxonomy.

GORDON, CLARENCE EVERETT, Amherst, Mass. Mass. Agric. Coll, B.S, 01; Boston Univ, B.S, 03; Columbia, A.M, 05; **N. Y. Bot. Garden, 05–06.** *Asst. prof. zool. and geol. Mass. Agric. Coll, 05–.*

Zoology, Geology, Paleobotany.

GRIFFITHS, DAVID, U. S. Dept. Agric, Washington, D. C. b. Aboristwyth, Wales, Aug. 16, 67. So. Dakota Agric. Coll, B.S, 92, M.S, 93; Columbia, Ph.D, 00; **N. Y. Bot. Garden,**

99–00. Tea. scis, H. S, Aberdeen, S. Dak, 93–98; prof. bot. Ariz, and bot. Ariz. Agric. Exp. Sta, 00–01; *asst. div. agrost, U. S. Dept. Agric, 01–.* Fel, A. A. A. S; Bot. Soc. Am; Nat. Geog. Soc; Bot. Soc. Wash; Wash. Acad. Sci; Torrey Bot. Club.

Gramineae; forage plants.

GROUT, LEON EVERETT, Jamaica, Vt. b. Newfane, Vt, Sept. 14, 77. Univ. of Vt, B.S, 02; Tea. Coll, Col. Univ. and **N. Y. Bot. Garden, 02–03.**

Agriculture.

GRUENBERG, BENJAMIN C, 69 West 88 St, N. Y. C. b. Czernowitz, Austria, Aug. 15, 75. Minnesota, B.S, 96; N. Y. Univ. Sch. of Pedagogy, 01–02; **N. Y. Bot. Garden, 02–06;** Columbia, A.M, 04. Sugar testing lab, U. S. Appraisers' Stores, N. Y. C, 98–02; *instr. biol, High Schs, N. Y. C, 02–;* tea. Evening Schools, N. Y. C, 02–03, 04–07; lecturer biol, Rand Sch. Social Sci, 07. A. A. A. S; N. Y. High Sch. Teas. Assoc; N. Y. Assoc. Biol. Teas.

Botany: Physiology of Nutrition; Zoology: Tropisms, etc. Mechanics of animal behavior; Pedagogy of science teaching.

HANKS, LENDA TRACY, 425 Nostrand Ave, Brooklyn, N. Y. b. New York, Jan. 1, 79. Columbia, A.B, 01, A.M, 02; **museum aid N. Y. Bot. Garden, 01–02;** Adelphi Coll, 03–04. Tea. sci, Adelphi Acad, Brooklyn, N. Y. C, 03–04; tea. biol, Girls Tech. H. S, 04–05; *tea. biol, Girls High Sch, 05–.* Torrey Bot. Club; Linnaean Soc.

Biology.

HARLOW, SARAH HAVENS, Norfolk, Conn. b. Florida, Orange County, N. Y, Oct. 20, 67. Wellesley, B.S, 91; **N. Y. Bot. Garden, 99–01;** Columbia, 00–01, A.M, 01. Tea. Amer. Collegiate Inst, Smyrna, Turkey, 93–96; Tuxedo Park Sch, Tuxedo Park, N. Y, 96–99; Randolph Cooley Sch, Plainfield, N. J, 01–03; *Private tutor, Norfolk, Conn, 04.*

HARPER, ROLAND MCMILLAN, College Point, N. Y. b. Farmington, Me, Aug. 11, 78. Univ. of Georgia, B.A, 97; **N. Y. Bot. Garden, 99–05;** Columbia, Ph.D, 05. Aid, U. S. Nat.

Herb, 01, 02; Forestry Collector, Geol. Surv. Ga, 03–04; **Museum Aid, N. Y. Bot. Garden, 04;** Bot, Geol. Surv. Ala, 05–06; Forestry Asst, Am. Mus. Nat. Hist, 06. New Eng, Bot. Club; Torrey Bot. Club; Nat. Geog. Soc; N. Y. Acad. Sci; A. A. A. S; Columbia Ph.D. Assoc; Ga. Forest Assoc.

Geography. Phytogeography of Eastern North America, especially of the Georgia coastal plain.

HAYNES, CAROLINE COVENTRY, Highlands, N. J, and 16 East 36 St, N. Y. C. b. N. Y. C, April 13, 58. Graduated from Mrs. Sylvanus Reed's Sch, 76; ***N. Y. Bot. Garden, 02–.*** Torrey Bot. Club; Sullivant Moss Chapter (v. pres, 08); Wild Flower Pres. Soc. Am; N. Y. Bot. Garden (Ann. Mem.).

Hepaticae.

HAZEN, TRACY ELLIOT, Barnard College, N. Y. C. b. Jericho Center, Vt, July 4, 74. Vermont, A.B, 97; Columbia, A.M, 99, Ph.D, 00; **N. Y. Bot. Garden, 99–00.** Director, Fairbanks Mus. Nat. Sci, St. Johnsbury, Vt, 01–02; asst. bot, *Barnard*, 02–03, tutor, 03–07, *instr*, *07–*. Fel, A. A. A. S; Bot. Soc. Am; Torrey Bot. Club; New Eng. Bot. Club; Vt. Bot. Club.

Algae, chiefly Chlorophyceae.

HENRY, FLORENCE (Mrs. Hervey W. Shimer), Mass. Inst. of Technology, Boston, Mass. b. Sacramento, Calif, Sept. 24, 79. N. Y. State Nor. Sch. Cortland, 97; Cornell, A.B, 01; Columbia, A.M, 02; Columbia and **N. Y. Bot. Garden, 02–03.**

HEWINS, NELLIE PRISCILLA, Elmhurst, N. Y. b. Maspeth, N. Y, Jan. 20, 78. Cornell, B.S, 98; Grad. stud, Cornell, 98–99; Columbia, A.M, 00; Secondary diploma, Tea. Coll, 00; Cold Spring Harbor Summer Sch, 01; Cornell Summer Session, 05; Alliance Française, Paris, Summer, 03; Stern Sch. of languages, 03–05; **N. Y. Bot. Garden, 99–00, 04–05;** *Tea. Coll. (Columbia), 06–;* Columbia Summer Sch, 07. Tea. sci, South Orange H. S, 01; *instr. biol, Newtown H. S, Elmhurst, L. I, 01–.* Torrey Bot. Club.

Teaching of Biology in Secondary Schools.

HOCKADAY, ELA, Sherman, Texas. No. Texas Nor. Sch; **N. Y. Bot. Garden, 05–06.**

Lichen flora of Texas. Morphology.

HOLM (HERMAN) THEODORE, Brookland, D. C. b. Copenhagen, Denmark, Feb. 3, 54. Grad, Copenhagen, 80; Catholic, Ph.D, 02; **N. Y. Bot. Garden (research sch.), 03.** Botanist and Zoologist, Danish North Pole Exped, 81–82; travelled in West Greenland as botanist and zoologist for the Danish Gov't, summers of 84–86; asst. bot, U. S. Nat. Mus, 88–93; U. S. Dept. Agric, 93–96. Danish, Swedish, French, German and Canadian sci. societies.

Anatomy and morphology of phanerogams.

HORNE, WILLIAM TITUS, Estación Central Agronomica, Santiago de las Vegas, Cuba. Univ. of Nebraska, B.S, 98; grad. stud, 98–00; fel, Columbia, 03–04; **N. Y. Bot. Garden, 03–04.** Instr. bot, Nebraska Wesleyan Univ, 98–00; instr. bot, Sch. Agric, Univ. Neb, 99–00; Botanical Seminar (Univ. Neb.).

Botany.

HOUSE, HOMER DOLIVER, N. Y. Bot. Garden, N. Y. C. b. Oneida, N. Y, July 21, 78. Syracuse Univ, B.S, 02; **N. Y. Bot. Garden, 02–03;** Columbia, M.A, 04. Asst. bot, Columbia, 03–04; substitute tea. bot, Rutgers, 04; aid, U. S. Nat. Mus, Div. Plts, 04–05; Bur. Plt. Industry, Dept. Agric, 05–06; assoc. prof. bot. and bact, Clemson Coll, S. C, 06–07; ***aid, N. Y. Bot. Garden, 07-.*** Torrey Bot. Club.

Taxonomy.

HOYT, WILLIAM DANA, 609 Lennox Street, Baltimore, Md. b. Rome, Ga, April 16, 80. Georgia, A.B, 01, M.S, 04; *Hopkins, 04–;* **N. Y. Bot. Garden, 07.** Tutor biol, Univ. Georgia, 01–04. Phi Beta Kappa.

Plant physiology, algae.

HUMPHREYS, EDWIN WILLIAM, 2155 Bathgate Ave, N. Y. C. b. New Jersey, June 15, 83. Coll. of the City of N. Y, A.B, 03; Columbia Summer Sch, 04, 05, M.A, 06; **N. Y. Bot. Garden, 05–06.** *Tea. Elementary Schs, N. Y. C, 03–.*

Geology, Paleobotany.

IRVING, MRS. LEONARD (See Rennert, Rosina Julia).

ISHAM, FLORENCE, **N. Y. Bot. Garden, 02–03.**

Taxonomy of local sedges.

JACKSON, HERBERT SPENCER, Newark, Del. b. Augusta, N. Y, Aug. 29, 83. Cornell, A.B, 05; **N. Y. Bot. Garden, 07.** Asst. bot. (Mycology), Cornell Summer Sch, 04; asst. bot. (Mycology), Cornell, 04–05; *asst. plt. path, Delaware Coll. Agric. Exp. Sta, Newark, Del, 05–; instr. bot, Delaware Coll, 05–.*

Mycology, plant pathology, flora of Delaware.

JOHNSON, DUNCAN STARR, Johns Hopkins Univ, Baltimore, Md. b. Cromwell, Conn, July 21, 67. Wesleyan, B.S, 92; Hopkins, Ph.D, 97; Tropical Lab, **N. Y. Bot. Garden (Cinchona), 03, 06.** Curator, Mus. Brooklyn Inst, 97; Munich, 01; *in charge crypt. bot, Biol. Lab. Brooklyn Inst, 96–;* assoc. bot, *Hopkins*, 98–01; assoc. prof, 01–05; *prof, 05–.* Bot. Soc. Am. (*Sec'y, 06–*); fel, A. A. A. S; Torrey Bot. Club.

Plant embryology, marine algae.

KELLICOTT, WILLIAM ERSKINE, Woman's College, Baltimore, Md. b. Buffalo, N. Y, April 5, 78. Ohio State, Ph.B, 98; Columbia, Ph.D, 04; **N. Y. Bot. Garden, 99–00.** Asst. zool, Barnard, 01–02, tutor, 02–05, instr. 05–06; *prof. biol. Woman's Coll. Baltimore, 06–.* N. Y. Acad. Sci.

Vertebrate morphology and embryology.

KERN, FRANK DUNN, Purdue Univ, Lafayette, Ind. b. Reinbeck, Ia, June 29, 83. University of Iowa, B.S, 04; Purdue Univ, M.S, 07; **N. Y. Bot. Garden, 06, research sch, 07, 08;** lab. asst. in animal morph. and physiol, Univ. of Ia, 02–04; spec. agt. Bur. of Plt. Industry, U. S. Dept. Agric, 04–05; *asst. bot. Purdue Univ. Agric. Exper. Sta, 05–.* Ind. Acad. Sci; A. A. A. S; Amer. Forestry Assoc; Amer. Breeders Assoc; Torrey Bot. Club; Sigma Xi.

Mycology, Uredinology.

KIMURA, TOKUZO, 501 West 22 St, N. Y. C. b. Hirobuchi, Miyagiken, Japan, Dec. 2, 80. Nogakushi from Sapporo Agric. Coll, Japan, 03; Stanford, A.B, 06; *grad. stud. Columbia, 07–;* ***N. Y. Bot. Garden, 07–;*** Tohoku Gakuin Missionary Coll, Sendai, Japan, 01–03.

Biology, Sex-determination, Artificial Parthenogenesis.

KING, CYRUS AMBROSE, 661 Flatbush Ave, Brooklyn, N. Y. C.

b. Plum Tree, Ind, June 6, 67. Indiana, A.B, 93; Harvard, A.B, 97, A.M, 98, Ph.D, 02; **N. Y. Bot. Garden, 03–04, 05.** Tea. nat. sci, H. S, Decorab, Ia, 93–96; asst. bot, Harvard, 96–00; asst. bot, Harvard Summer Sch, 97–01; Radcliffe, 99–00; instr, Indiana, 00–02; instr, in charge Bot. Biol. Sta, Indiana Univ. Summer Sch, 02; tea. biol, De Witt Clinton H. S, N. Y. C, 02–07; *first asst. biol, Erasmus Hall H. S, Brooklyn, 07–.* Fel, A. A. A. S; Soc. Nat. Cent. States; Torrey Bot. Club; N. Y. Assoc. Biol. Tea.

Cytology.

KIRKWOOD, JOSEPH EDWARD, Hacienda de Cedros, Mazapil, Zac. Mex. b. Cedar Rapids, Ia, Jan. 24, 72. Pacific Univ, A.B, 98; special fel. in biol, Princeton, 98–99, A.M, 02; Columbia and **N. Y. Bot. Garden, 99–01, 02, 04 (research sch.)**; Columbia, Ph. D, 03. Asst. in bot, Columbia Summer Sch, 00; asst. in biol, Tea. Coll, Columbia, 00–01; instr. bot, Syracuse, 01–03; assoc. prof. bot, 03–07; prof. bot. and head of dept, 07; *asst. bot, Dept. Investigation, Continental-Mexican Rubber Co, 07–.* Fel, A. A. A. S; Sigma Xi; Torrey Bot. Club; Bot. Soc. Am.

Economic Botany, Embryology, Ecology.

KNOX, ALICE ADELAIDE, Care of Miss M. F. Knox, Lakewood, N. J. b. Point Pleasant, N. J, Aug. 28, 76. Smith, A.B, 99; Columbia, A.M, 06; **N. Y. Bot. Garden, 04–05.** Demonstr. bot, Smith, 00–01; asst. bot, Barnard, 03–05; asst, Cold Spring Harbor, 04; **lab. asst, N. Y. Got. Garden, 05–06;** asst, Dept. Bot. Res. Carnegie Inst, 06–07; teacher, The Knox School, Lakewood, N. J. Torrey Bot. Club; Barnard Bot. Club.

Plant morphology and physiology

KORNMANN, ELSIE W, Nor. Coll, N. Y. C; **N. Y. Bot. Garden, 00–01.**

KUPFER, ELSIE M, Cedarhurst, N. Y. b. Bayreuth, Germany, Sept. 5, 77. Barnard, A.B, 99; Columbia, A.M, 01; Ph.D, 07; *Columbia and* ***N. Y. Bot. Garden, 01–.*** Asst. bot, Columbia summer session, 01, 02; tea. biol, L. I. City H. S, 02; *tea. biol, Wadleigh H. S, 03–.* Torrey Bot. Club; Wild Flower Pres. Soc. Am.

Plant physiology.

LEAVENWORTH, GEORGE, St. Genevieve, Mo. b. St. Genevieve, Mo, Sept. 30, 75. Missouri, A.B, 02; **N. Y. Bot. Garden, 02–03**; Columbia, 03.

Forestry.

LEWIS, IVEY FOREMAN, Cor. Fayetteville and Hargett Sts, Raleigh, N. C. No. Carolina, A.B, 02, M.S, 03; Hopkins, 03–07; **N. Y. Bot. Garden (Cinchona), 06;** Marine Biol. Lab, Naples, 07–08.

Algae.

LIVINGSTON, BURTON EDWARD, Desert Bot. Lab, Carnegie Inst, Tucson, Ariz. b. Grand Rapids, Mich, Feb. 9, 75. Michigan, B.S, 98; Chicago, Ph.D, 01. **N. Y. Bot. Garden, 03 (research sch.), 05.** Asst. bot. lab, Michigan, 95–98; instr. sci, H. S, Freeport, Ill, 98–99; asst. plant physiol, Chicago, 99–04, assoc, 04; field work, Mich. Geol. Surv, 01; collaborator, U. S. Bur. Forestry, 02; instr. biol, summer sch, Easton, Ill. State Nor. Sch, 03; Carnegie research asst, 04; soil expert, U. S. Bur. Soils, 05–06; *mem. staff, Desert Bot. Lab, Carnegie Inst, 06–.* Fel, A. A. A. S; Am. Soc. Nat; Bot. Soc. Am. Walker prize, Boston Soc. Nat. Hist, 03.

Plant physiology and ecology; Soil Physics.

LIVINGSTON, MRS. FLORA VIRGINIA, Scarsdale, N. Y. **N. Y. Bot. Garden, 04, 05.**

Mycology.

LOCKE, EMILY PAULINE, 72 Mt. Auburn St, Watertown, Mass. Smith, B.L, 00; **N. Y. Bot. Garden, 02.**

Embryology of spermatophyta.

MACINTYRE, LUCY, 303 West 74 Street, N. Y. C. b. New York City, Dec. 5, 64. Miss Leverett's School, N. Y. C, 73–79; The Misses Graham School, 79–83; Dresden, Germany, 83–84; **N. Y. Bot. Garden, 03–04, 05, 06, 07, 08.** Torrey Bot. Club; A. A. A. S; League for Political Education.

Morphology of algae. General bryology.

MARBLE, DELIA WEST, Bedford, N. Y. b. New York City, 68. Spec. stud, Columbia, 97–98, 05; **N. Y. Bot. Garden, 01–02.**

Private tutoring in botany. Torrey Bot. Club; Wild Flower Pres. Soc. Am.

Local Flora N. Y. C, Ferns and Mosses.

MATHEWSON, CHESTER A, Station A, Cincinnati, O. b. Cincinnati, O, Dec. 11, 78. Chicago, 99; Cincinnati, 01–03; Yale, 03–04; **N. Y. Bot. Garden, 04–05;** Columbia, B.S, 05; A.M, 06; *Coll. P. & S. (Columbia), 07–;* instr. Technical Sch. of Cincinnati, 98–03; Tea. Coll. (Columbia), 05–06; Plainfield (N. J.), H. S, 06–07; *H. S. Commerce, N. Y. C, 07–.* Am. Nat. Stud. Soc; N. Y. Assoc. Biol. Teas. (sec'y.).

MAXON, WILLIAM RALPH, U. S. Nat. Museum, Washington, D. C. b. Oneida, N. Y, Feb. 27, 77. Syracuse, Ph.B, 98; **N. Y. Bot. Garden, 03; research sch, 05. Asst, N. Y. Bot. Garden, 98;** aid, crypt. bot. *Div. of Plts, U. S. Nat. Mus,* 99–05, *asst. curator, 05–.* Fel, A. A. A. S; Linnaean Fern Chapter (pres, 00–01); Bot. Soc. Wash; Wash. Acad. Sci; Wild Flower Pres. Soc. Am, (charter mem.).

Taxonomy of ferns.

MIDDLETON, FLORENCE, 366 St. Nicholas Ave, N. Y. C. b. New London, Conn, Aug. 2, 63. Nor. Coll, N. Y. C, 85; Tea. Coll, Columbia, 00–02; Barnard, 02–08; Cold Spring Harbor, 04; **N. Y. Bot. Garden, 05–06.** *Asst. tea. biol, Wadleigh H. S, N. Y. C, 04–.* Wild Flower Pres. Soc. Am.

Biology, botany.

MILLSPAUGH, CHARLES FREDERIC, 5748 Madison Ave, Chicago, Ill. b. Ithaca, N. Y, June 20, 54. Ithaca Acad, 69–71; Cornell, 72–75; N. Y. Homoep. Med. Coll, M.D, 81; **N. Y. Bot. Garden, 03.** Prof. bot. W. Virginia, 91–92; *curator, Dept. Bot. Field Mus. Nat. Hist, 94–; professorial lecturer bot, Chicago, 95–; prof. med. bot, Chicago Homeop. Med. Coll. 96–;* Mem. Pan Am. Commission Med. Plants, 99–01. Wild Flower Pres. Soc. Am, (charter mem, director, 02–); Explorers Club; Broome Co. (N. Y.) Homeop. Med. Soc, (hon. mem.); Binghamton (N. Y.) Acad. Sci, (hon. mem.); Mexican Med. Soc, (hon. fel.); Brazilian Med. Soc; Torrey Bot. Club; A. A. A. S; Soc. Nat. Cent. States; Sigma Xi; Geog. Soc. Chicago; ed, Homeop.

Recorder, 89–90; has studied at **various times in herbarium, N. Y. Bot. Garden** and other Amer. herbaria, Kew, British Museum Nat. Hist, Linnaean Society, Owen's College, Manchester, Leyden, Berlin, Praag, Vienna, Florence, Geneva, and Paris.

Systematic botany.

MOLWITZ, ERNESTINE, 88 East 165 St, N. Y. C. Columbia, A.B, 02; **N. Y. Bot. Garden, 01–03.**

Plant anatomy and physiology.

MULFORD, FANNIE AUGUSTA, Hempstead, N. Y. b. Nevada City, Calif, Sept. 20, 55. **N. Y. Bot. Garden, 02–03.** Wild Flower Pres. Soc. Am, (charter mem.); Torrey Bot. Club.

Flora of Long Island.

MURRILL, WILLIAM ALPHONSO, N. Y. Bot. Garden, N. Y. C. b. Campbell County, Va, Oct. 13, 69. Virginia Polytechnic Inst, Agric. Course, 86; Mechan. Course and B.S, 87; Randolph-Macon Coll, B.S, 89; A.B, 90; A.M, 91; Cornell, Ph.D, 00; **N. Y. Bot. Garden, 01–04.** Prof. nat. sci, Bowling Green Sem, Va, 91–93; prof. nat. sci, Wesleyan Female Inst, Va, 93–97; Cornell, scholar in bot, 98–99; asst. crypt. botanist, 99–00; tea. biol, De Witt Clinton H. S, N. Y. C, 00–04; **asst. curator, *N. Y. Bot. Garden*, 04–05; first asst, 06–07; *asst. director, 08–*.** Sigma Xi; Torrey Bot. Club; Bot. Soc. Amer.

Mycology.

PALLISER, HELEN LETITIA, Vassar College, Poughkeepsie, N. Y. b. Bridgeport, Conn, May 4, 82. Barnard, A.B, 05; Tea. Coll, Columbia, 03–05; Columbia, A.M, 06; **N. Y. Bot. Garden, 05–06;** *asst. biol, Vassar, 06–*. Torrey Bot. Club.

Mycology.

POND, RAYMOND HAINES, Bonn Univ, Bonn, Germany. b. Topeka, Kansas, March 3, 75. Kansas State Agric. Coll, B.S, 98, M.S, 99; Univ. of Michigan, Ph.D, 02; **N. Y. Bot. Garden (research sch.), 05, 06, 07;** *Bonn Univ, Germany, 07–*. Asst. bot, Kan. State Agric. Coll, 95–97, asst. chem, 97–98; asst. in charge of herbarium, Univ. Michigan, 98–99, asst. plt. physiol, 99–00; spec. investigator, Bur. Fisheries, 99, 00, 01;

asst, bot. and path, Maryland Agric. Coll. & Exp. Sta, 00–01 ; instr. chem. and biol, Township H. S, Sterling, Ill, 02–03 ; prof. bot. and pharmacog, and director miscrop. lab, Northwestern, 03 –07 ; asst. plt. physiol, Chicago, 06. Fel, A. A. A. S ; Bot. Soc. Am ; Bot. Cent. States ; Sigma Xi ; Am. Soc. Biol. Chem. (charter mem.).

Plant physiology.

RAND, EDITH EDWINA, 223 West 106 St, N. Y. C. b. Norwich, Conn. Smith, A.B, 99, fel, 99–00 ; Woods Hole Biol. Lab. fel. zool, 00, fel. bot, 01 ; **N. Y. Bot. Garden, 01–02 ;** Tea. Coll, Columbia, A.M, 02. Lab. asst, zool, Smith, 97–00 ; *tea. biol. sci, Horace Mann H. S, 02–.*

Botany.

REA, PAUL MARSHALL, The Charleston Museum, Charleston, S. C. b. Cotuit, Mass, Feb. 13, 78. Woods Hole, 98–99 ; Williams, A.B, 99 ; Columbia and **N. Y. Bot. Garden, 99–00 ;** Williams, A.M, 01 ; Columbia, 02–03. Asst. biol, Williams, 00–02 ; field asst, Bur. Forestry, U. S. Dept. Agric, 02, 03 ; *prof, Coll. of Charleston and director Charleston Mus, 03– ; instr. Woods Hole, 06–.* Am. Ass. Museums (*Sec'y, 07–*) ; A. A. A. S ; *ed, Bull. Charleston Mus, 03–.*

Museum administration, Zoology, Polychaetae, Oligochaetae, fauna of S. C.

RENNERT, ROSINA JULIA, (Irving, Mrs. Leonard), 366 W. 120 St, N. Y. C. b. N. Y. City, July 8, 78. Nor. Coll, N. Y. C, A.B, 97 ; Columbia, A.B, 01, A.M, 02 ; **N. Y. Bot. Garden, 99–01, 02–04.** Asst. tea. biol, Washington Irving H. S, N. Y. C, 02–03 ; Wadleigh H. S, N. Y. C, 03–07. A. A. A. S.

Plant anatomy and physiology.

ROBINSON, CHARLES BUDD, JR, Bureau of Science, Manila, P. I. b. Pictou, Nova Scotia, Oct. 26, 71. Dalhousie (Halifax), B.A, 91 ; Cambridge, Eng, non-collegiate, 97–98 ; Christ's Coll, 98–99 ; Columbia and **N. Y. Bot. Garden, 03–06 ;** Columbia, Ph.D, 06. Tea, Kings County Acad, N. S, 92–93 ; tea, Pictou County Acad, 93–97, 99–03 ; night schools, N. Y. City, (No. 3, Bronx), 03–06 ; **asst. curator, N. Y. Bot. Garden, 06–07;**

econ. bot, Bureau of Science, Phil. Govt, 08–. Torrey Bot. Club; Bot. Soc. Am; Nova Scotian Inst. of Sci; Sigma Xi.

Systematic botany, especially phanerogams of eastern Canada and the Philippine Islands.

ROBINSON, WINIFRED JOSEPHINE, Vassar College, Poughkeepsie, N. Y. b. Johnstown, Mich, Oct. 17, 67. Mich. State Nor. Coll, 92; Mich. Agric. Coll, summer, 94; Univ. of Mich, B.S, B.Pd, 99; Woods Hole Marine Biol. Lab, summer sch, 99, 00; **N. Y. Bot. Garden, 02, 03 (research sch.), 04, 07–08;** Columbia, M.A, 04. Instr, training dept, Mich. State Nor. Coll, 93–05; *instr. in biol, Vassar Coll, 00–;* **lab. asst, N. Y. Bot. Garden, 07–08.** A. A. A. S; Am. Soc. Nat; Torrey Bot. Club.

Biology, botany.

RUBRECHT, WILLIAM KELLER. Muhlenberg Coll, B.A, 01; **N. Y. Bot. Garden, 02.**

Algae and fungi.

SAGE, LILLIAN BELLE, 34½ East 12 St, N. Y. C, or Norwich, N. Y. b. Norwich, N. Y. Mt. Holyoke; Cornell, A.B, 01. **N. Y. Bot. Garden, 06–08.** *Tea. biol, Washington Irving H. S, N. Y. C, 04–.* Torrey Bot. Club; Sigma Xi.

Mosses.

SCHWARTZ, EDITH, (Mrs. F. E. Clements), University of Minnesota, Minneapolis, Minn. Nebraska, A.B, 98; **N. Y. Bot. Garden, 02.**

Experimental evolution.

SCOTT, GEORGE GILMAN. Williams, A.B, 98, A.M, 99. **N. Y. Bot. Garden, 99.**

Algae.

SEAVER, FRED JAY, No. Dakota Agric. Coll, Fargo, N. D. b. Webster Co, Ia, 77. Chicago, summer, 01; Morningside, B.S, 02; univ. scholar bot, State Univ. of Iowa, 02–03; spec. asst. to Dr. Arthur, Purdue, spring, 03; fel. bot, State Univ. of Iowa, 03–04, M.S, 04; fel. bot, Columbia, 06–07; **N. Y. Bot. Garden, 06–07.** Asst. bot, State Univ. of Iowa, 04–05; instr. (in full charge) biol, Iowa Wesleyan, 05–06; elected prof. biol,

06; *asst. prof. bot, N. Dak. Agric. Coll, 07–.* Fel. Iowa Acad. Sci; Sigma Xi.

Mycology.

SELBY, AUGUSTINE DAWSON, Ohio Agric. Exp. Station, Wooster, O. b. Athens Co, O, Sept. 2, 59. Ohio State, B.S, 93; **N. Y, Bot. Garden, 03–04.** Supt. schs, Huntington, W. Va, 84–86; principal, H. S, Ironton, O, 86–87; tea. bot, H. S, Columbus, O, 90–94; botanist and chemist, *Ohio Agric. Exp. Sta*, 94–02; *botanist, 02–.* Fel, A. A. A. S; Bot. Soc. Am; Bot. Cent. States; Ohio Hort. Soc. (chairman, Comm. Veg. Path, 95–08); O. Acad. Sci, (*pres*, 01); Columbus Hort. Soc, (sec'y, 88–89, 91–94); St. Louis Acad. Sci; Torrey Bot. Club.

Diseases of plants.

SHEAR, CORNELIUS LOTT, U. S. Dept. of Agric, Washington, D. C. b. Coeymans Hollow, N. Y, March 26, 65. N. Y. State Nor. Sch, Albany, N. Y, 88; Univ. Nebraska, 94–98; undergrad. scholar, 94–97; B. S, 97; grad. fel, 97–98; A.M, 01; **N. Y. Bot. Garden (research sch.), 03;** George Washington, Ph.D, 06; studied in various European laboratories and herbaria three months in 05. Spec. Field Agt. Div. of Agrost, U. S. Dept. Agric, summers of 95, 96 and 97; asst. agrost, *U. S. Dept. Agric*, 98–01; asst. path, 01–02; *path, 02–;* ed, Asa Gray Bull, 98–00; assoc. ed, Plant World, 00–05. Sigma Xi; fel, A. A. A. S; Bot. Soc. Am; Wash. Biol. Soc; Bot. Soc. Wash; Wild Flower Pres. Soc. Am. (charter mem.).

Plant Pathology.

SHIMER, MRS. HERVEY W. (see Henry, Florence).

SHIMER, HERVEY WOODBURN, Mass. Inst. of Technology, Boston, Mass. b. Martin's Creek, Pa, April 17, 72. Gettysburg, 91–93; Lafayette, A.B, 99, A.M, 01; Columbia, Ph.D, 04; **N. Y. Bot. Garden, 02–03;** Harvard, 04–05. Tutor mod. lang, Lafayette, 99–01; asst. paleont, Columbia, 01–03; non-res. lecturer stratig. geol, *Mass. Inst. Tech*, 03; *instr, 03–;* instr. Hist. Geol. and Physiog, Yale Summer Sch, 07. A. A. A. S; Boston Soc. Nat. Hist; Am. Anthrop. Assoc; Nat. Geog. Soc; Am. Forestry Assoc; Assoc. of Ph.Ds of Columbia; Sigma Xi.

Geology, stratigraphy, paleontology, etc.

SHOEMAKER, CORNELIA JANNEY. Swarthmore, A.B, 94; **N. Y. Bot. Garden, 01–02;** instr. Friends' Seminary, N. Y. C.

Plant physiology.

SHREVE, FORREST, Woman's College, Baltimore, Md. b. Easton, Md, July 8, 78. Hopkins, A.B, 01, Ph.D, 05; Bruce fel, 05–06; hon. asst, **N. Y. Bot. Garden (Cinchona), 05–06;** instr. in charge phanerogamic bot, Biol. Lab, Cold Spring Harbor, 04, 05; assoc. prof. bot, Woman's Coll, Baltimore, 06–08; *member of staff, Desert Bot. Lab, Carnegie Inst. Wash, Tucson, Ariz, 08–.* Torrey Bot. Club.

Plant ecology, regional botany.

SLATEK, FLORENCE W. Cornell, B.S, 00; **N. Y. Bot. Garden, 00–01.**

SLOSSON, MARGARET, 852 Lexington Ave, N. Y. C. b. Paris, France. **N. Y. Bot. Garden, 02–03, 04.** Linnaean Fern Chapter (sec'y, 00–01).

Pteridology.

STEWART, LILIAN, 533 Manhattan Ave, N. Y. C. Carlton College; **N. Y. Bot. Garden, 04–05.**

Plant physiology.

STOCKARD, CHARLES R, Columbus, O. Miss. Coll. Agric. and Mech. Arts, B.S, 99, M.S, 02; **N. Y. Bot. Garden, 04–05.**

Cytology.

STREETER, STELLA GEORGIANA, Cummington, Mass. b. Cummington, Mass, Aug. 6, 74. Smith, B.L, 98; **N. Y. Bot. Garden, 02–03;** Columbia, M.A, 03; Tea. Coll. Columbia, Masters Diploma, 03. Head dept. sci, H. S, Hempstead, N. Y, 99–02; tea. biol, H. S, Trenton, N. J, 04–07; *tea. bot, H. S, Jersey City, N. J, 07–.*

Plant physiology.

TORREY, JOHN CULTER, Cornell University Medical Coll, N. Y. C. b. Burlington, Vt, April 19, 76. Vermont, A.B, 98; **N. Y. Bot. Garden, 99–00;** Columbia, Ph.D, 02; *fel, Exp. Path, Med. Coll, Cornell, 04–.* Asst. zool, Columbia, 00–01; bacteriologist, Sea Side Hosp, Staten Id, N. Y, 03–04; asst. instr. histol. and bacter, Med. Coll, Cornell, 03–04. Soc. Exp. Biol. and Med; N. Y. Acad. Sci.

Medicine, pathology.

UHLIG, WILLIAM CULLEN, 242 Halsted St, East Orange, N. J. b. New York, Dec. 22, 70. Columbia, Ph.B, 96; Ph.D, 04; **N. Y. Bot. Garden, 02–03.** *Asst. analyt. chem, Columbia, 99–.* Soc. Chem. Industry; Nat. Geog. Soc.

Sanitation, water supply.

VALENTINE, MORRIS CRAWFORD, 259 West 131 St, N. Y. C. b. N. Y. City, April 18, 76. Coll. City of N. Y, A.B, 96; Columbia (P. & S.), 96–98; Path. Inst. State Hospitals for Insane, 98–01; **N. Y. Bot. Garden, 04.** Tea. chem, Harlem (N. Y. C.) Evening H. S. for men, 00–04; asst. tea. biol, De Witt Clinton H. S, N. Y. C, 01–04; *Wadleigh H. S, N. Y. C, 04–.* A. A. A. S.

Teaching of biology.

WANG, CHUNG YU, Care Lin Fong & Co, 29 West Houston St, N. Y. C. Univ. Tientsin, China, 99; Columbia, A.M, 04; **N. Y. Bot. Garden, 04–05.**

Paleobotany.

WATTERSON, ADA, (Mrs. Robert M. Yerkes), 30½ Mellen St, Cambridge, Mass. b. Cleveland, O. Columbia, A.B, 98, A.M, 00; **N. Y. Bot. Garden, 99–00;** Marine Biol. Lab, Cold Spring Harbor, 99, 01; Marine Biol. Lab, Woods Hole, 00, 06; Harvard Summer Sch, 06. Asst. bot, Barnard, 99–02, asst. bot. and zool, 01–02; tutor biol, Tea. Coll. (Columbia), 02–05; instr. nat. study, Summer Sch, Columbia, 04–05.

Plant and animal physiology.

WHIPPLE, DORRIS WILLIAM. N. Y. Coll. Pharmacy, Ph.G, 01; **N. Y. Bot. Garden, 02.**

Bacteriology.

WHITE, VIOLETTE S, (Mrs. John Ross Delafield), Riverdale-on-Hudson, N. Y. C, or 17 East 79 St, N. Y. C. **N. Y. Bot. Garden, 01–02.** Fel, Wild Flower Pres. Soc. Am; Torrey Bot. Club; N. Y. Bot. Garden (life mem.).

Taxonomy.

WILCOX, EDWIN MEAD, Auburn, Ala. b. Busti, N. Y, May 21, 76. Ohio State, B. S, 96; Harvard, A.M, 98, Ph.D, 99; fel, 99–00; **N. Y. Bot. Garden, 04.** Asst. bot, Ohio State, 94

97 ; prof. bot. and entom, Okla. Agric. and Mechan. Coll, 00–01 ; biol. and hort, Ala. Polytech, 01–04 ; *prof. bot, and plt. physiologist and pathologist, Ala. Exp. Sta, 04–.* Fel, A. A. A. S ; Am. Soc. Nat.

Plant anatomy.

WILKINS, LEWANNA, Eastern High School, Washington, D. C, or 1414 Girard St, Washington, D. C. b. Fairfax Co, Va, Jan. 21, 69. Wellesley, B.S, 91 ; Martha's Vineyard, summers 92, 94 ; Woods Hole, (Wellesley Coll. Table) 96 ; C. Hart Merriam's Camp, Mt. Shasta, Calif, summer 98 ; Goettingen, (Germ.), spring and summer, 01 ; Chicago, summer 05 ; Columbia, summer 07 ; **N. Y. Bot. Garden, two weeks in Sept, 07.** *Tea. biol, Eastern H. S, Washington, D. C, 92–.* Wild Flower Pres. Soc. Am, (charter mem.).

Taxonomy.

WILSON, GUY WEST, Upper Iowa Univ, Fayette, Ia. b. Carmel, Ind, June 19, 77. De Pauw, B.S, 02, A.M, 03 ; Purdue, M.S, 06 ; **N. Y. Bot. Garden, 06–07 ;** prof. biol. and curator mus, Mount Union Coll, Alliance, O, 03–04 ; instr. bot, LaFayette (Ind.), H. S, 04–05 ; **aid, N. Y. Bot. Garden, 06–07 ;** *prof. biol. and curator mus, Upper Iowa Univ, Fayette, Ia, 07–.* Ind. Acad. Sci.

Local Flora of Indiana. Mycology.

WOLD, EMMA MARIE, 658 Patterson St, Eugene, Oregon. b. Trondhjem, Norway, Sept. 29, 73. Oregon, A.B, 94, A.M, 97 ; Univ. Calif, Summer Sch, 03 ; Columbia and **N. Y. Bot. Garden, 04–05 ;** *Univ. Oregon, 07–.* Instr. Sci, Eugene H. S, Eugene, Ore, 99–04 ; instr. biol, Mills Coll, Calif, 05–07.

Algae.

WOOD, GEORGE CLAYTON, 798 Lincoln Place, Brooklyn, N. Y. b. Mexico, Oswego Co, N. Y, Feb. 2, 78. Syracuse, A.B, 00 ; Columbia and **N. Y. Bot. Garden, 04–05 ;** Tea. hist, Syracuse Class. Prep. Sch, 99–00 ; principal, Jefferson Gram. Sch, Little Falls, N. Y, 00–02 ; tea. biol, Port Richmond H. S, Port Richmond, Staten Id, N. Y, 02–03 ; *asst. tea. biol, Boys' H. S, Brooklyn, N. Y, 03–.* Amer. Acad. Soc. and Polit. Sci ; Brooklyn Inst.

Arts and Sci. (mem, exec. comm, dept. bot.); publisher H. S. Biol. Leaflet (periodical) Brooklyn, N. Y, 06–08.

Plant distribution and ecology, lichenology.

WORTHLEY, IRVING TUPPER. Cornell Forest Sch, 00–02; **N. Y. Bot. Garden, 03.**

Native and cultivated shrubs.

YAMANOUCHI, SHIGEO, Univ. of Chicago, Chicago, Ill. b. Tokyo, Japan, Sept. 7, 76. Tea. Coll, Tokyo, M.S, 98; Columbia and **N. Y. Bot. Garden, 04–05;** Chicago (including Woods Hole Marine Biol. Lab.), 05–07, Ph.D, 07. Asst. prof, Tokyo Tea. Coll, 04; *asst. bot, Chicago, 07–.* A. A. A. S.

Cytology.

YATSU, NAOHIDÉ, Columbia, N. Y. C. b. Tokyo, Japan, Sept. 8, 77. Imper. Univ, Tokyo, A.B, 00; Columbia, Ph.D, 05; **N. Y. Bot. Garden, 03–05.** Soc. Exp. Biol. and Med; Tokyo Zool. Soc.

Zoology, cytology, embryology.

YERKES, MRS. ROBERT M, (See Waterson, Ada).

YORK, HARLAN HARVEY, Univ. of Texas, Austin, Tex. De Pauw, B.S, 03; Ohio State, A.M, 05; stud. asst. chem, De Pauw, 01–02; tutor human anat. and physiol, De Pauw, 01–02; stud. asst. bot, De Pauw, 02–03; fel. bot, Ohio State, 03–04, asst. bot, 04–05; fel, Columbia and **N. Y. Bot. Garden, 05–06;** spec. asst. bot, Nat. Mus. (Wash.), 06; assoc. in bot. Biol. Lab, Cold Spring Harbor, 06, 07; elected spec. asst. Dendrology, Amer. Mus. Nat. Hist, 06; *instr. bot, Texas, 06–:* Ohio Acad. Sci; Tex. Acad. Sci; A. A. A. S.

Taxonomy.

ZELENY, CHARLES, Indiana Univ, Bloomington, Ind. b. Hutchinson, Minn, Sept. 17, 78. Minnesota, B.S, 98, M.S, 01; **N. Y. Bot. Garden, 01–02;** Chicago, Ph.D, 04. Instr. zool, *Indiana,* 04–07, *assoc. prof, 07–.* Fel, A. A. A. S; Soc. Zool.

Zoology.

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Vol. 25, part 1, issued August 24, 1907, contains descriptions of the family Geraniaceae by Miss L. T. Hanks and Dr. J. K. Small, the Oxalidaceae and Linaceae by Dr. J. K. Small, and the Erythroxylaceae by Dr. N. L. Britton.

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EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

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BOTANICAL EXPLORATION IN JAMAICA.

TO THE SCIENTIFIC DIRECTORS,

Gentlemen: In continuation of botanical exploration of the West Indies previously authorized, I spent the month of March and part of the month of April in Jamaica, being absent from the Garden for this purpose from February 22 to April 16. I was accompanied by Mrs. Britton and Dr. Arthur Hollick, who assisted me in the collection, care and preparation of the large collection of plants and specimens secured, and, during the month of March, we were favored by the company and assistance of Mr. Wm. Harris, Superintendent of Public Gardens and Plantations of Jamaica.

Special attention was given to the flora of the coastal regions of the island and to that of hills and mountains near the coast, previous collecting on behalf of the Garden having been mainly accomplished in the interior. In order to carry the work forward efficiently, the schooner "Nellie Leonora" of Nassau, used by us on several occasions for botanical exploration in the Bahamas, was chartered from Mr. W. J. Pinder and sent to Kingston, where we found her upon our arrival on the steamer "Trent," on March 27.

Three days were given to outfitting and to visits to Hope Gardens, Kingston, where we were hospitably received by the Hon. Wm. Fawcett, Director of Public Gardens and Plantations, and where plants and specimens desirable for our collections were secured; some collecting was done in the vicinity of King-

ston and at Hardware Gap in the higher mountains. I was cordially received at King's House by Sir Sydney Olivier, Governor of Jamaica, who had most kindly anticipated the needs of the expedition, upon the request of Mr. Fawcett, by issuing a general order to harbor masters and other officials, including the police, to aid our work in any way possible; this order relieved our schooner of all port charges, gave us efficient assistance just where it was needed, obtained for us time-saving information on many occasions, and was, altogether, most important in the prosecution of our work. I have expressed to His Excellency our keen appreciation of his valuable coöperation.

Mr. Harris, Dr. Hollick and I set sail in Kingston Harbor on the morning of March 2 and made our first stop the same day at Fort Henderson, at the mouth of the harbor, where the day was spent in studying the flora of the Salt Pond Hills, a very dry region abounding in cactuses and other plants requiring but little rainfall. Leaving Fort Henderson at daybreak on March 3, we reached Old Harbour Bay early in the afternoon, and went ashore on Little Goat Island, where we found, among other interesting species, the white-flowered vine-like tree *Vallesia glabra*, of the Dogbane Family, new to Jamaica. March 4 was given to collecting on the adjacent Great Goat Island; this island is interesting not only on account of certain rare trees growing there, but also because it is the only place inhabited by the iguana in Jamaica; we saw many of these large lizards, which, on being startled, race through the bushes with great speed, seeking refuge in holes and crevices of the limestone.

Sailing south and west the following morning, the day of March 5 was spent near the extreme southern promontory of Jamaica, between Portland Point and Rocky Point. Here we were delighted to find a primitive race of cotton (*Gossypium*) growing on a rocky plain elevated a few feet above the sea, and on the coastal sand dunes, over an area about a mile long and in places several hundred feet wide. The region is singularly devoid of weeds of cultivation, and the nearly complete absence of soil practically forbids cultivation. On the rocky plain the cotton plants attained an average height of about four feet, while on the

sands they grow higher, sometimes up to fifteen feet. The small flowers of this interesting race open white in the morning and fade pink; the small pods are nearly round, pointed, and the cotton fiber is short and adheres to the seed. Some of the plants are very hairy, others very nearly without hairs. We secured a quantity of the seeds, some of which I immediately sent by mail to Mr. F. V. Coville, Chief of the Division of Botany, United States Department of Agriculture, Washington, D. C., for experimental work in plant breeding, and Mr. Harris took a supply to Hope Gardens; abundant museum and herbarium specimens were also collected. Among many interesting shrubs and trees observed here, the beautiful and rare *Catesbaea parviflora*, a low shrub of the Madder Family with small dark green leaves and snow-white berries, deserves special mention.

We anchored during the night in Carlisle Bay and early next morning, March 6, set sail for Bluefields, the course being west to Pedro Bluff, where we spent several days last September, and then nearly northwest, the total distance about fifty miles; an obliging "norther" blew vigorously during the day, and after some beautiful sailing we landed at the old castle at Bluefields early enough in the afternoon to make arrangements with the willing corporal of police for the ascent next day of Bluefields Mountain, and also had time to study the coastal thickets a mile or two west of the town.

Bluefields is classic ground biologically, for here resided the English naturalist Gosse during his visit to Jamaica, and it was mainly here that the materials for his books, entitled "The Birds of Jamaica" and "A Naturalist's Sojourn in Jamaica," were derived. We gave March 7 to the ascent of Bluefields Mountain, traversing some of the region studied by Gosse. Ponies were supplied by Police Corporal A. A. Williams, and Constable Wallace was detailed as guide. The land has been much cleared for cultivation since the visit of Gosse and it was only after long riding that we came to tracts of forest at altitudes of over 2,200 feet, where some species not heretofore collected by us were obtained, notable among them a fine red-flowered *Columnea*, a vine of the Gesneria Family, which we hope to introduce into

cultivation, and three species of the bromeliad *Hohenbergia*, a genus well developed in Jamaica, and known, like other bromeliads, to the natives as "wild pine," the pine-apple belonging to the same natural family. We drifted across Bluefields Bay to Savanna-la-Mar, on the morning of March 8, arriving in time to pay our respects to Hon. Arthur W. Vickers, Custos of Westmoreland, and Mrs. Vickers at their sugar estate, "Fontabelle," where Mrs. Britton had been their guest for a week while collecting in the vicinity. Mr. and Mrs. Vickers gave us valuable information relative to the extreme western end of Jamaica, which we were next to examine botanically, and we gratefully appreciate their kindness and hospitality.

The land about Savanna-la-Mar is a plain almost all under cultivation, and of botanical interest mainly in its crops of sugar-cane and logwood. We therefore sailed westward at once on the morning of March 9, reaching Negril, at the southwestern point of the island, in the afternoon, and remained there until the afternoon of March 12, exploring the thickets and wood-lands on the hills and near the coast, by aid of information and personal guidance of Mr. J. S. Brownhill, Lighthouse Superintendent at Negril Point. These yielded specimens of many rare species, including the "wild sago" (*Zamia*), the existence of which in Jamaica was known only from a stem seen by Professor Grisebach in the botanical museum of the Royal Gardens, Kew, prior to 1860, but not preserved there at the present time. This fine cycad inhabits rocky woodlands east of Negril and is locally abundant. Its stem is nearly embedded in the soil, and its leaves reach a height of over three feet. March is evidently not its flowering season, but after long search Mr. Harris found a ripe cone, and several plants with staminate flowers were obtained. We dug out a quantity of the plants for cultivation, and for Museum specimens, these stems containing much starch, like their Bahamian congeners. Dr. Hollick made a careful drawing of the cone, which was afterwards preserved in formalin, so we obtained complete materials for the illustration of this interesting species. These rocky woods yielded also bulbs of a fine spider-lily (*Hymenocallis*) unknown to us. Opportunity was

taken at Negril for exploring the borders of the Great Morass of Westmoreland, a marsh of large extent similar in some of its features to the Everglades of Florida. The rare tree *Crudya spicata* seen by us last September on the banks of Black River was again found, as well as the marsh cabbage palm (*Roystonea*), and ripe seeds of both were taken for germination. Here we found ourselves in a veritable forest of the long thatch palm (*Geonoma Swartzii*) with ripe fruit, a magnificent sight long to be remembered.

Sailing northward on March 13 we cast anchor in the afternoon in Green Island Harbour, and devoted the two days following to the hills in that vicinity, to those about Fish River and to the coast near Orange Bay. We were hospitably entertained by Arnold G. Clodd, Esq. at his estate, "Phoenix," where we found another rare spider-lily (*Hymenocallis*) on a rocky hill, and by other members of the Green Island Club. Mr. R. F. Lindo, of Fish River, kindly permitted us to examine his interesting woodlands, where we obtained specimens and seeds of a fine thatch palm (*Thrinax*) and of other interesting trees; we could have spent more time there to advantage. In Orange Bay River, under the guidance of Mr. W. A. Hewitt, we were much pleased to find quantities of the beautiful aquatic fern *Ceratopteris*, rare in Jamaica, and obtained needed specimens for comparison with the related species of South Florida for Mr. R. C. Benedict, who is studying this group of ferns for "North American Flora." We made the attempt to send living plants, in a large can of water, to Hope Gardens, in the hope of establishing them there and subsequently removing them to the aquatic house at the Garden, but the plant proved to be very tender and delicate, and the necessary delay in shipping until we reached the railroad at Montego Bay, has probably defeated us; through the aid of Mr. Hewitt, we hope to succeed at another time.

After beating the strong northeast wind nearly all day, the beautiful harbor of Lucea was reached in the afternoon of March 16 and here we anchored until the morning of March 21, giving four days to the study of Dolphin Head and adjacent hills and mountains some six miles back from the coast. Mrs. Britton

had come to Lucea several days previous and had secured convenient quarters in a cottage on the shore; the collections had now become so large that the time of all members of the party was fully occupied in their increase, care and preservation and this condition obtained during the rest of the trip, one or two persons usually remaining in camp or on the boat with the specimens while the others collected. We are indebted to the Hon. Mr. Sanftleben, Custos of Hanover, for advice and aid.

Mr. Harris had made a previous visit to Dolphin Head and had obtained specimens of some rare plants, but his work was then hampered by almost continuous rain. This time we had two clear and splendid mountain days and two broken ones. The ascent is made from Askenish, a village at 600 feet elevation, reached by carriage from Lucea; Dolphin Head is 1,816 feet high. Its forests contain a variety of trees and shrubs not known to grow elsewhere, and our collections there include specimens of over two hundred species. An elegant white-flowered *Blakea*, a vine of the Melastoma Family, clothes the trees in places; the nickel tree (*Ormosia*), a tall forest tree related to our locusts, is endemic here, as is the red-flowered shrub *Gesneria scabra*, and there are many fine orchids and bromeliads. Here Mrs. Britton found rich collecting ground for mosses and hepatics. On a wooded foothill we found the magnificent tree *Hernandia* with its curious pouch-like, translucent fruits, each enclosing one black eight-ribbed seed; in order to secure these we had to have felled a tree over sixty feet high, with a trunk diameter of about two feet, and this afforded us an interesting illustration of the efficiency of the machete, our negro guide hacking this large trunk through with the long thin blade in less than half an hour, quite as expeditiously as one of our northern woodsmen would have done it with an axe and apparently with no greater effort. We had to fell many trees here and elsewhere in order to get their flowers or fruits, though in many instances they were had by climbing; this same guide gave us an unconscious expert exhibition of climbing on one occasion when we sent him up a fifty foot *Mayepaea*, and happened to notice that he balanced the machete on his head all the way up to the lowest branch, some thirty feet!

Montego Bay, reached on the afternoon of March 21, was made the base of operations until the afternoon of March 25. Here Dr. A. T. McCatty obligingly permitted us to use his sanatorium, on the shore, as a very convenient and hospitable working place; we are also indebted to Messrs. J. E. Kerr & Co. for courtesies and information. The collecting grounds were low hills near the bay, and the range of mountains some six miles to the southeast on which the Kempshot Observatory, established by Judge Maxwell Hall, is situated. On the coastal hills we found the creeping vine *Callisia*, of the Dayflower Family, not hitherto reported from Jamaica, and in the mountains about Kempshot many trees and shrubs not previously seen by us, including an undescribed species of prickly ash (*Zanthoxylum*) wholly devoid of prickles, another thatch palm (*Thrinax*), and the broad-stemmed *Rhipsalis*, an interesting climbing cactus.

Near Montego Bay we had a good opportunity to observe the disease of the cocoanut palm which has caused much damage to the crop in places, evidenced by the yellow color of the foliage, the small size and reduced number of the nuts produced, and the eventual death of the trees. The trouble seems to be caused by planting the trees on level stretches of land too little elevated to give them the drainage they require. We observed several groves in such situations between Montego Bay and Port Antonio and they were almost invariably affected, while those on slopes or on sand dunes were healthy. The simple remedy is to avoid planting cocoanuts in poorly drained soils. The same conditions obtain near Nassau, New Providence, Bahamas, where the trees are unhealthy over a large low level area where they have been planted.

Sailing from Montego Bay in the afternoon of March 25, the schooner reached St. Ann's Bay the next afternoon, and four days were then devoted to the study of the coastal vegetation from Roaring River Falls to Runaway Bay and to the hills a few miles to the south. The flora of the Parish of St. Ann's has been little known recently, and it proved to be quite different in many features from that of regions hitherto explored by us. The Roaring River, which reaches the sea about four miles east of St. Ann's Bay, is a picturesque stream and in its valley we found

some interesting shrubs and trees; about two miles back from the coast it plunges over a rocky precipice, forming a very attractive cascade which is a landmark for mariners, being visible many miles from shore; near its mouth, where it passes under the road from St. Ann's Bay to Ocho Rios, there is a series of low waterfalls separated by nearly level stretches which present the curious aspect of many large trees growing directly in the water. These trees are mainly the "wild olive" (*Bucida Buceras*) and the large-leaved "anchovy pear" (*Grias cauliflora*). Their seeds germinate in the calcareous travertine or tufa deposited from the water, and individuals of all ages may be seen growing under these unusual conditions. This valley, containing these two remarkable natural features, ought to be made a park, and all encroachments of cultivation rigidly prevented; as it is, the land along the river at the foot of the cascade has already been cleared and cultivated and presents an unattractive aspect, much of it grown up with weeds: the natural features could be restored by judicious planting and care of native trees and shrubs. One can only imagine what a glorious natural landscape it must have presented before it was devastated for the production of a few dollars worth of agricultural products annually. Near Runaway Bay the land is a nearly level rocky plain, with many sink-holes, covered by low woods and thickets, physiographically much like portions of the Bahama Islands, and here grow several kinds of plants not seen by us elsewhere in Jamaica; this region would doubtless repay further investigation at another time of year. On the ocean cliffs at Eton Hall, Runaway Bay, grows the characteristic *Rhacicallis maritima*, a shrub of the Madder Family, known in Jamaica only at this point, but common on the coasts of other West Indian Islands; we were cordially received and entertained at Eton Hall by Rev. and Mrs. Geo. Leonard Chaney. At Liberty Hill, St. Ann's Bay, the Misses Stennart kindly furnished aid and information; from this hilltop a magnificent ocean view is obtained, the Cuban mountains being visible under favorable atmospheric conditions. We are also indebted to Mr. A. B. Berrie for letters of introduction and other assistance.

At this time Mr. Harris was obliged to return to Hope Gardens

on account of the approaching retirement of Mr. Fawcett from the position of Director of Public Gardens and Plantations. Being especially desirous of learning more about the flora of St. Ann's Parish back from the coast, I concluded to abandon the further examination of the coastal region at this time, and on March 30 Mrs. Britton proceeded to Moneague, where a new base was established. I took the schooner to Port Antonio on March 31, and gave the next day to collecting on the hills a few miles to the southeast, and about the marshes east of the town, where I found quantities of a pretty yellow-flowered bladderwort (*Utricularia*).

I sent the schooner home to Nassau on April 2 and travelled by rail to Bog Walk, where I had a few hours time between trains for a study of the hillsides and the magnificent deep valley of the Cobre River. Here I met Dr. Hollick, who had remained for a week at Montego Bay, and proceeded with him in the afternoon by rail to Ewarton and by carriage to Moneague, where we rejoined Mrs. Britton. The party remained at Moneague until the morning of April 9, and, although hampered to some extent by rain, collected specimens of some 250 species, most of them different from those previously obtained. There is considerable original forest remaining on the hills and mountains of St. Ann's, and much time would be necessary to explore the region completely; we rediscovered some of the rare species found here by the older collectors. To F. B. Sturridge, Esq., of Union Hill, we are under special obligations for aid and hospitality; his beautiful estate, largely forest lands, reaches elevations of some 2,200 feet, and here we collected many varieties, including fine fruiting specimens of the thatch palm (*Thrinax tessellata*), previously observed in the neighboring hills at Hollymount, from which a crop of seedlings may be grown. We were also much pleased to see the large forest tree, black yacca (*Podocarpus Purdieanus*), of the Yew Family, from which fine specimens were obtained. Bromeliads, orchids, mosses and ferns were collected in variety.

The day of April 4 was given to the "Fern Gully," on the road from Moneague to Ocho Rios. We had heard much of this ravine, but were unpleasantly surprised to find that its great natural beauty has recently been vandalized by the planting of

bananas and other food-plants and the necessary clearing of its sides for this purpose in places quite down to the roadway. It is really a great deprivation, at least to visitors, that this marring of the beauty of the gully should have been permitted ; the only apparent way to correct the evil is to make a park of the valley, clear out the extraneous bananas and other unnatural features and permit the wild ferns and other interesting plants to resume their former attractiveness and beauty.

Leaving Moneague on the morning of April 9, we proceeded to Kingston. The next day was given to packing the collections and to a visit to Ferry River, about six miles east, especially for specimens of the rare shrub *Bumelia rotundifolia*, of the Sapodilla Family, growing on the hillsides there, and for some water plants which inhabit that river and its banks. We boarded the steamer "Orinoco" in the evening and sailed for New York early next morning, arriving on April 16.

Altogether, on the expedition, 1,407 field numbers of specimens and plants were secured, the total number of specimens aggregating nearly 4,000, and to these are to be added some 400 collection numbers of Mr. Harris, of which we will receive the duplicates. The work has added materially to our knowledge of the West Indian flora and to its representation at the Garden.

My original plan for the expedition was to cross over to eastern Cuba for about ten days, after having spent most of March in Jamaica, and upon the request of Judge Addison Brown, Chairman of the Executive Committee of the Board of Managers of the Garden, the Commandant of the United States Naval Station at Guantanamo, Cuba, had been requested by the Honorable Secretary of the Navy to permit me to land there for the purpose of collecting plants and specimens and to facilitate this work. I found, however, that more time than I anticipated was necessary to accomplish what I wished to do in Jamaica, and also concluded that ten days in eastern Cuba would be insufficient to obtain what we desire from that region, so I decided to defer the Cuban work, and have so informed the Commandant at Guantanamo.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

NOTES, NEWS AND COMMENT.

Professor A. H. R. Buller, of the University of Manitoba, Winnipeg, recently visited the Garden to examine the collections of fungi.

A work on North American trees by Dr. N. L. Britton, assisted by Dr. J. A. Shafer, appeared May 6. This work is fully illustrated, and is comprehensive, including also many tropical species as well as those of temperate regions.

Dr. Small visited Washington and Baltimore late in April to examine collections of flowering plants in connection with his work on "North American Flora."

The herbarium of the late Professor A. P. Morgan has been given to the University of Iowa. A number of his specimens of fungi are to be found in the Ellis collection at the Garden. Professor Morgan was one of the leading mycologists of the country. Two others, Professor Underwood and Professor Kellerman, have died during the past winter.

The spring course of lectures to the 4B and 5B grades of the public schools of the Bronx, comprising fifteen lectures with accompanying demonstrations, began April 20 and closed May 22.

Mr. Percy Wilson recently visited Philadelphia and Washington to examine specimens of certain groups of plants which he is monographing for "North American Flora."

The eighth annual meeting and floral exhibition of the Horticultural Society of New York were held at the Garden on May 13 and 14. Dr. B. T. Galloway lectured before the Society on "The Foundations of Successful Violet Culture." A feature of the exhibition was the attractive display of orchids by the recently established Orchid Section.

The fifth annual botanical field "symposium" will be held at Georgetown, Delaware, July 6 to 12. The botanical clubs of Philadelphia and Washington will coöperate with the Torrey Botanical Club on this occasion as in former years.

Dr. Murrill visited Washington about the middle of April to examine the collection of Boleti at the Division of Vegetable

Pathology, and to confer with Dr. Metcalf, of the Division of Forest Pathology, regarding the distribution of the chestnut canker.

Meteorology for March. — The total precipitation recorded for March was 2.35 inches. Snow fell on the 2d, 3rd and 6th, hail on the 17th and 18th. Maximum temperatures were recorded of 51° on the 7th, 63° on the 16th, 79.5° on the 27th ; also minimum temperatures of 20.5° on the 5th, 21° on the 10th and 21st, and 30° on the 26th.

Meteorology for April. — The total precipitation recorded for April was 2.22 inches. Maximum temperatures were recorded of 61° on the 2d, 77° on the 7th, 63° on the 13th, 84° on the 26th, 72° on the 28th ; also minimum temperatures of 21.5° on the 5th, 31° on the 10th, 26° on the 17th, and 30° on the 21st.

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104 specimens of North American plants collected by C. A. Geyer. (By exchange with the British Museum.)

50 specimens, "Phycotheca Boreali-Americana," Fascicle 29. (Distributed by Messrs Collins, Holden and Setchell.)

1 specimen of rust from Nevada. (Given by Dr. P. B. Kennedy.)

2 specimens of *Entyloma compositarum* from Central Park. (Given by Dr. E. B. Southwick.)

1 type specimen of *Sorosporium confusum* from Newark, Delaware. (Given by Mr. H. S. Jackson.)

1 specimen of *Porodisculus pendulus* from Newark, Delaware. (Given by Mr. H. S. Jackson.)

7 specimens of *Boletus* from Missouri and Pennsylvania. (Given by Dr. N. M. Glatfelter.)

2 specimens of fungi from Forked River, New Jersey. (Given by Mr. W. H. Ballou.)

4 specimens of *Clitocybe dealbata deformata* from East Hartford, Connecticut. (Given by Mr. C. C. Hanmer.)

61 specimens of polypores from Fayette, Iowa. (Given by Professor G. W. Wilson.)

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PLANTS AND SEEDS.

1 plant of *Pandanus utilis* for conservatories. (By exchange with New York Zoölogical Society.)

2 tubers of *Dioscorea* sp. for conservatories. (Given by Dr. H. H. Rusby.)

61 plants from Jamaica for conservatories. (Collected by Dr. and Mrs. N. L. Britton.)

98 plants for woody collections. (Purchased.)

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2 plants of *Agave barbadensis* for conservatories. (By exchange with Missouri Botanical Garden.)

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1 packet of Dwarf Sunflower seed. (Given by Dr. W. A. Murrill.)

1 packet of seed of *Ipomoea* sp. from Cuba. (By exchange with United States National Museum, through Dr. J. N. Rose.)

2 packets of seed of *Atractylis gummifera*. (Given by Mr. H. C. Pearson.)

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13 plants derived from seed from various sources.

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WILLIAM ALPHONSO MURRILL

Assistant Director

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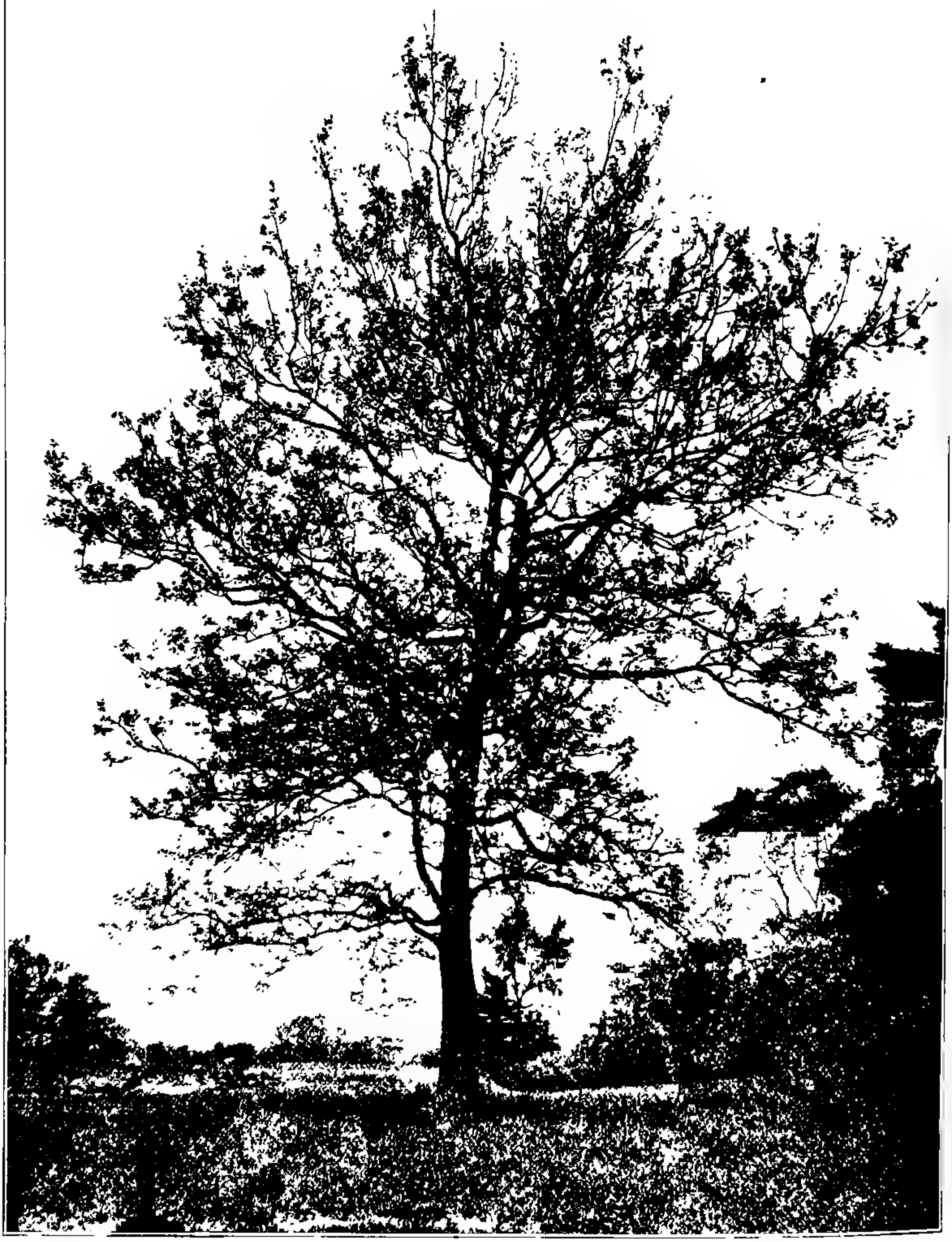

PLANE-TREE NEAR MUSEUM BUILDING AFFECTED WITH LEAF BLIGHT.

JOURNAL

OF

The New York Botanical Garden

VOL. IX. June, 1908. No. 102.

LEAF BLIGHT OF THE PLANE-TREE.

A brief account of this disease, with illustrations, was given in the JOURNAL for July, 1907, when the plane-trees on the grounds of the Garden had somewhat recovered from a severe attack that began in May and lasted through the month of June. This serious outbreak of the disease was due to the remarkably late and wet spring. Many other diseases caused by fungi also develop rapidly under such conditions. Several plane-trees in the Garden were examined at the time and in every case the fungus (*Gloeosporium nervisequum*) was found to be present in the injured leaves and twigs. The presence of the fungus was also reported by investigators in other localities.

In the report of the botanist of the Connecticut Agricultural Experiment Station issued in May, 1908, Dr. G. P. Clinton refers to the death of the young leaves of the plane-tree (*Platanus occidentalis*) in the spring of 1907, and ascribes the injury entirely to the severe frosts of May 11 and May 21. Dr. H. von Schrenk held the same opinion last year, and published a short article in the report of the Missouri Botanical Garden, describing "frost injuries" to the plane-trees in the Mississippi Valley and eastward.

The blight was first noticed here this year on May 22, after several days of rainy weather. All of the plane-trees on the grounds were attacked, but most of them recovered in about two weeks, the spring weather being very different from that of 1907. As predicted last year, the terminal twigs were nearly all dead, and the new shoots were from lateral buds a foot or more from

FIG. 13. Twigs from plane-tree shown in frontispiece.

the tips of the branches. The accompanying illustrations, made from the same tree figured in last year's JOURNAL, show the condition of the tree and its smaller branches on May 25, 1908. The fungus present in the small pustules on the dead twigs is *Hymenula platani* Lév. (*Discula platani* Peck), considered a mere form of the *Gloeosporium nervisequum*, which attacks the opening buds.

W. A. MURRILL.

ADULTERANTS IN FOODS AND DRUGS AND THEIR DETECTION.*

A very earnest and intelligent salesman for one of our largest wholesale grocery houses recently assured me that the most depressing feature connected with his business, namely, competition against grossly adulterated goods, has been largely eliminated by the pure food law, one of the most wholesome and beneficent acts of legislation that has been bestowed upon the American people since the abolition of slavery.

I might remind you here that it is not necessary for all, or even a majority of those engaged in a business to act dishonestly, in order to bring about its demoralization. There is a strong tendency for the entire body to work down toward its lower standards. The great body of those engaged in irregular practices are themselves disgusted with their conditions, and perhaps, after all, the most important effect of the purification process now going on is the relief of a great body of honest and honorable young employees from the sickening and deadly influence of being compelled, day after day, year in and year out, to do things against which their consciences revolt.

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* From a lecture delivered June 6, 1908, at the New York Botanical Garden. The lecturer, after quoting numerous publications on the subject of food and drug adulterations, deplored the disposition of many writers to give a sensational aspect to the subject, and of others to minimize its seriousness. Although it was not a part of his present duty to discuss the extent to which the adulteration of foods and drugs is practiced, he would state, from intimate personal knowledge, that there is enough of it to demand systematic, sustained and powerful measures for its repression and control.

It must be noted that two fundamental objects are sought in the administration of our present food and drugs law. The first is to save the purchaser from getting something which is either positively injurious, or which lacks the value to him which it should possess. There is no real difference of opinion as to the propriety of carrying on this part of the campaign. The second is to exclude what is known as the "intent to deceive," even though such deception does not result in any injury to the purchaser; even though it might perhaps confer a greater material benefit upon him than if the deception had not been practiced. To the unthinking mind, the last mentioned offense is apt to be lightly regarded and it is against its suppression that the chief activity of commercial critics has been directed. To the moralist, however, this offence is rightly regarded as worse by far than the mere infliction of some material injury. It is here that the great contest is being waged at the present time. Some influential authorities under the federal government are being misled into winking at, and in some cases openly sustaining, the most flagrant acts of deception, while others are stoutly contending that this feature of the law is deserving of the most earnest support.

I desire specially, before leaving this subject, to bring forcibly to your attention the fact that there is in operation such a powerful, systematic and sustained attempt at improvement as I have referred to; that its methods of investigation are as reliable as its motives are sincere, and that when it delivers an opinion to you, you are justified, in the main, in accepting the same as sound, in spite of any protestations to the contrary by those who are either self-interested, or irresponsible and ignorant of the facts. This is not saying that mistakes cannot occur, but in so far as you yourselves lack information, it is necessary that you should trust in some one, and I would urge you to give your confidence and support to a movement that is being most intelligently and conscientiously carried on.

Reminding you that, as an institution, our interest in this subject is purely botanical, I will refer to three methods for determining the purity and quality of our foods and drugs. The first is that of practical trial, foods being supplied to animals and the

nutritive results observed and recorded, or medicines being so administered and their physiological and therapeutic effects observed by trained experimenters, delicate apparatus often being employed for the purpose. This method is manifestly very difficult, if it is to be made at all certain ; so much so that its very practicability is only now beginning to be generally acknowledged.

The second method is that of quantitative chemical analysis or assaying. This method is accurate and reliable, but the possible field of its application, especially in relation to vegetable drugs and medicines, is quite limited in the present state of our knowledge.

The third method is the examination of the physical characters of the drug, especially its structure. This is the natural method of examining the article when entire. When it comes to us in the form of a fine powder, as it usually does, its examination can be conducted only by the aid of the microscope. The possibility of identifying the minute elements of these powders has been to a great extent doubted, even by many scientific people who should know better. Only a week ago a very prominent pharmacist acquaintance expressed surprise at my reference to this work, saying that he supposed that as yet it was mere theory.

We have only to reflect that each of the cellular elements composing the plant is just as much a complete individual as is the whole plant and that it has its own characteristic structure and life history. It will not then surprise us to be told that many of the cells of plants, properly magnified, can be recognized with as much certainty as can other natural objects.

It is true that until very recently little could be done in this direction, but this fact was due wholly to lack of knowledge of methods and substances. Within the last few years, thanks to the services of Kraemer, Schneider, Jelliffe, Nelson, Mansfield and others in this country, and many foreign workers, the minute structure of a large part of our drugs has been made known to us. I do not claim to be one of the leaders in this work, but I have followed the investigations of these men with the greatest interest and profit, and I have endeavored to bring together this afternoon a number of cases illustrating the importance of the

work, the certainty of its results, and the nature of the methods by which it is carried on.

One of the very first things for which the pharmacognosist looks in identifying a drug powder or fragment is the presence or absence of starch grains, and their peculiarities, if present. Starch is probably in most cases the first compound formed by the leaves of the plant out of carbon dioxide and water, and most plants store it in the form of granules. These granules have a distinct plan of structure, which differs in different plants. The size and form are also characteristic of the plant producing them. I exhibit here a very instructive illustration of a group of starch grains, taken from Kraemer's work. Observe the very large grains of potato and arrow-root, with their very distinct rings. The hilum is near the end in both, but in the second it is fissured. Wheat starch has a rather small grain, distinguished by its lenticular shape, very well seen in the granules which present their edges to view, and by the central hilum. Corn starch is peculiar in its angular outline and its fissured central hilum. Curcuma starch is very beautifully formed and marked, although it reminds one of the appearance of some bugs. All starch grains must be measured, the upper limits of size being fairly constant. Their occurrence singly or in groups is also significant of their identity. In this picture of Colchicum corm you see them mostly grouped in threes and fours, and having a very peculiar hilum.

This next picture illustrates potato starch grains altered by moist heat. It is not unusual for a dishonest drug miller to grind up with a good drug a portion of exhausted material, from which medicine has already been made. Such material is first put into a still to drive off its alcohol, in which process it is steamed. By this steaming it is swollen and its shape altered and it loses its characteristic markings.

In this specimen of *Inula*, or Elecampane, you look in vain for starch-grains. It belongs to that largest of all plant families, the daisy family, which forms none. This family yields a great number of drugs and you at once see that if adulterated with a drug from another plant, we are very likely indeed to find starch

grains, which at once exposes the fraud. You do see a reserve food material in these cells, but it is inulin, a substance which approaches nearer to sugar than starch does.

The drug *Lycopodium*, here shown, consists of the spores of various species of that genus, especially *L. clavatum*. The peasants gather and store it in flour bags, so that cereal starches are apt to occur in it. Advantage is often taken of this fact to fraudulently add such substances. In this case we must be guided in our judgment by the amount of starch present.

Another article exceedingly abundant in the cells of plants is calcium oxalate, which occurs in crystals of various beautiful forms, a number of which are here shown. The needle-shaped crystals occur in squill and many other drugs of the lily family. The rosette masses are common in *Viburnum*, the doubly pointed prisms in soap-bark and the loose masses resembling sand in belladonna leaves.

Belladonna root is a drug that is used on an enormous scale in this country, being imported from Europe. During the past year nearly all that was imported contained an admixture of poke-root. The properties of the two are widely distinct, and the adulteration was a serious one. The two roots as presented in this picture are of very different appearance, but when mixed in small pieces through the bales the poke can very easily go undetected. When powdered, there is no general difference in the appearance ; but viewed with the microscope, the pokeroot shows numerous needle-shaped crystals which are entirely wanting in the belladonna. This poke is the species that occurs in Europe. In the one of this vicinity, these crystals are much larger, so that we can actually determine whether the adulteration took place in Europe or in this country.

These illustrations indicate the use that is made not only of these but of numerous other contents of cells in detecting adulteration. The cells themselves are often indicative of the same condition. One of the most important classes of such cells is the stone-cell. This variety of cell is usually rather short, and consists almost wholly of wall, that is, it has a very small cavity. The wall is hard and heavy, and this sort of cell is used by the

plant, as builders use stone or brick, in forming strong and impenetrable walls. Hence we find it largely composing shells of nuts and the endocarps of fruits. These, being waste products, are for sale at very low prices and in abundant quantity, so that they are favorite adulterating substances. Olive pits are very largely ground up for this purpose, and their stone-cells are here shown. You will at once see how readily these could be detected in this powdered aconite root. They are very largely used in ground black pepper.

Those of cocoanut shells are very similar, as here shown, but they look somewhat different after the shell has been roasted. Both the raw and roasted article have been traded in to the extent of several car-loads at a single sale. They have been used with especial frequency for the adulteration of chocolate, the pure powder of which is here shown.

One of the most interesting of these stone-cells is that in birch-bark. After the aromatic oil has been distilled from birch to be sold under the name of oil of wintergreen, the residue is useless, and it is not infrequently added to powdered drugs. It is not only of peculiar shape, but many of the cells have a bright red spot, here of course showing black. I have recently found it in powdered ipecac. This is a peculiarly villainous form of adulteration, because, as most of you know, ipecac is frequently our sole reliance in saving the life of a child attacked with croup.

One of the most interesting cases of adulteration is that of pinkroot (*Spigelia*) with the root of *Ruellia*, which possesses none of the properties of the former. So common is this adulteration that I have almost never seen a lot that was both genuine and pure. So positive was I that the published descriptions and pictures of the powder of *Spigelia* were incorrect, that I took some roots of each from flowering plants, and gave them to my associate, Dr. Mansfield, for study. It turns out that not one of the many descriptions and pictures has failed to describe or illustrate the false for the genuine. Here is one of these pictures, and there is scarcely an element in it that does not pertain to the *Ruellia*.

Closely related to stone-cells are the fibers of plants, the long,

thick-walled cells that give strength and toughness to woods and barks. It often happens that a food or drug that contains no fibers is adulterated with some article that does, and the fact is at once shown by the microscope. Capsicum or cayenne pepper should be made by grinding up peppers from which the stems and hulls (calyx) have been removed. When a careless or greedy miller violates this rule, these fibers tell the story.

Gentian, although a large root, is another drug that contains no fiber, as you see by this picture, yet I have last year condemned two very large lots which consisted to the extent of 50 per cent. of coarse fiber, perhaps old bags or ropes ground up.

One of the most valuable drugs at the present day, from both a pecuniary and medicinal point of view, is the root of *Hydrastis* or golden seal. Its price, about $2.00 per pound, makes it a favorite article for adulteration, since a very handsome profit can be made by adding only 10 per cent. or even 5 per cent. of cheap adulterant, an amount that may readily pass undetected. As you can see, there are no fibers in it, and almost everything that would probably be used for its adulteration, contains them. Nevertheless, I am satisfied that we know little as yet about the adulteratian of this drug, and that we are constantly accepting as pure lots that are adulterated. The subject is one most in need of investigation. This picture is of great interest, since it displays two crystals that you would think, after previous explanations, consist of calcium oxalate. They are in reality the sulphates of two important alkaloids, hydrastine and berberine, which occur in this drug.

We have now given considerable attention to the inner elements of the plant; let us consider some of the externals. Many years ago I was deeply impressed by the publication by one of our scientific directors, Mr. Charles F. Cox, of a valuable paper on a subject then little known, the characteristic features of plant hairs, or trichomes. I remember with what surprise I read his statement that in many cases the family of a plant could be determined by examining its hairs. Since then I have come to see these trichomes used for the unerring determination, not of families merely, but of species of plants in the form of dust powders.

One of the interesting oriental drugs is *Kamala*, consisting of the glands and hairs abraded from the surface of a fruit related to the castor oil plant. These glands and hairs are very well known, but I here show you an illustration of them.

I present here an illustration of the henbane leaf, one of our most important drugs, in order that you may note the great variety of glandular hairs which it bears. The subject of this drug and its adulteration is one of the most interesting that presents itself to us at the present time. The drug is extremely variable in its percentage of alkaloid, it being most common for it to fail to contain the required one twelfth of 1 per cent. There is another species of *Hyoscyamus* (*H. muticus*), growing in Egypt, and forming an immense spreading herb often weighing more than half a hundred weight. It can be collected in great quantity and very cheaply. This species often contains from ten to fifteen times as much alkaloid as the other. Since this alkaloid is not of the same kind, and has not the same medicinal properties as that of the other, there should be no substitution. As a matter of fact, however, it has been quite common during the past year to add a quantity of this spurious article to an inferior henbane so as to bring up its alkaloidal percentage. The article is revealed by its large stellate hairs, and the peculiar convoluted walls of its cells, here exhibited.

The hairs of *Digitalis*, or fox-glove, look somewhat like those of henbane, though it is not difficult to distinguish them. I have this season condemned a lot of powdered digitalis because it contained the hairs here shown, with their surfaces thickly papillose or warty; showing the presence of *Stramonium*. Desirous of checking my work, I gave some of it, as digitalis, to our chemist, asking him to determine its constituents. He reported that it contained a mydriatic alkaloid, which is just what stramonium contains. Fox-glove, on the other hand, contains glucosides, but no alkaloid.

In the same lot of powdered drugs which contained the digitalis last mentioned, there was some stramonium, so labeled, which contained such hairs as are here shown and which indicate chestnut leaves. It is very rarely that we encounter them in this

stellate form, since the powdering process detaches the hairs individually, or in twos or threes, from the rosette. The chestnut leaf has been a favorite artiticle for use in adulterating other powdered leaves.

We come next to one of the most interesting cases of adulteration, or rather of substitution, that I have ever encountered. The complete disentanglement of what has become a system of error, which I shall shortly undertake, will carry us back nearly two centuries, to the early history of Peru. Suffice it to say here that the two plants shown side by side have been collected under the name of Matico. Surely no botanist present will object to my claims that they are distinct species, one *Piper angustifolium*, the other *P. Mandonii*. The former is the genuine drug, the latter the substitute. Yet, different as these are, my decision has been criticised in various places. I am told that botanists at the National Herbarium have done so, and an official scientific body in Germany has given the foreign shipper a certificate that the last named drug is genuine. Mansfield's examination shows the hairs of the genuine, as here shown, single and weak, with thin walls. In the spurious species, these hairs are stellate and have the walls so greatly thickened as to almost obliterate the lumen. Upon incineration these leaves yield more than double the amount of ash of the other, and this ash contains two or three times the percentage of silica. Its medicinal properties are much weaker.

The picture of *Aspidium*, or male fern, here presented is unfortunately not characteristic. Among other things, this drug is characterized by the presence of glandular hairs, which, instead of growing outward upon the surface, grow inward into the intercellular spaces. This drug should contain no fibers, but its powder is frequently loaded with them. Male fern, as a remedy for tape-worms, has come to be regarded by physicians as a very unreliable medicine. I believe, on the contrary, that it is one of the most reliable, and that its bad reputation is due almost wholly to the enormous extent to which the drug has been adulterated.

H. H. RUSBY.

THE LACE-BARK TREE.

Among the many interesting trees of the island of Jamaica, there is one of peculiar interest on account of the unusual character of its inner bark, which, when freed from the outer confining bark and spread out, much resembles linen lace, hence its popu-

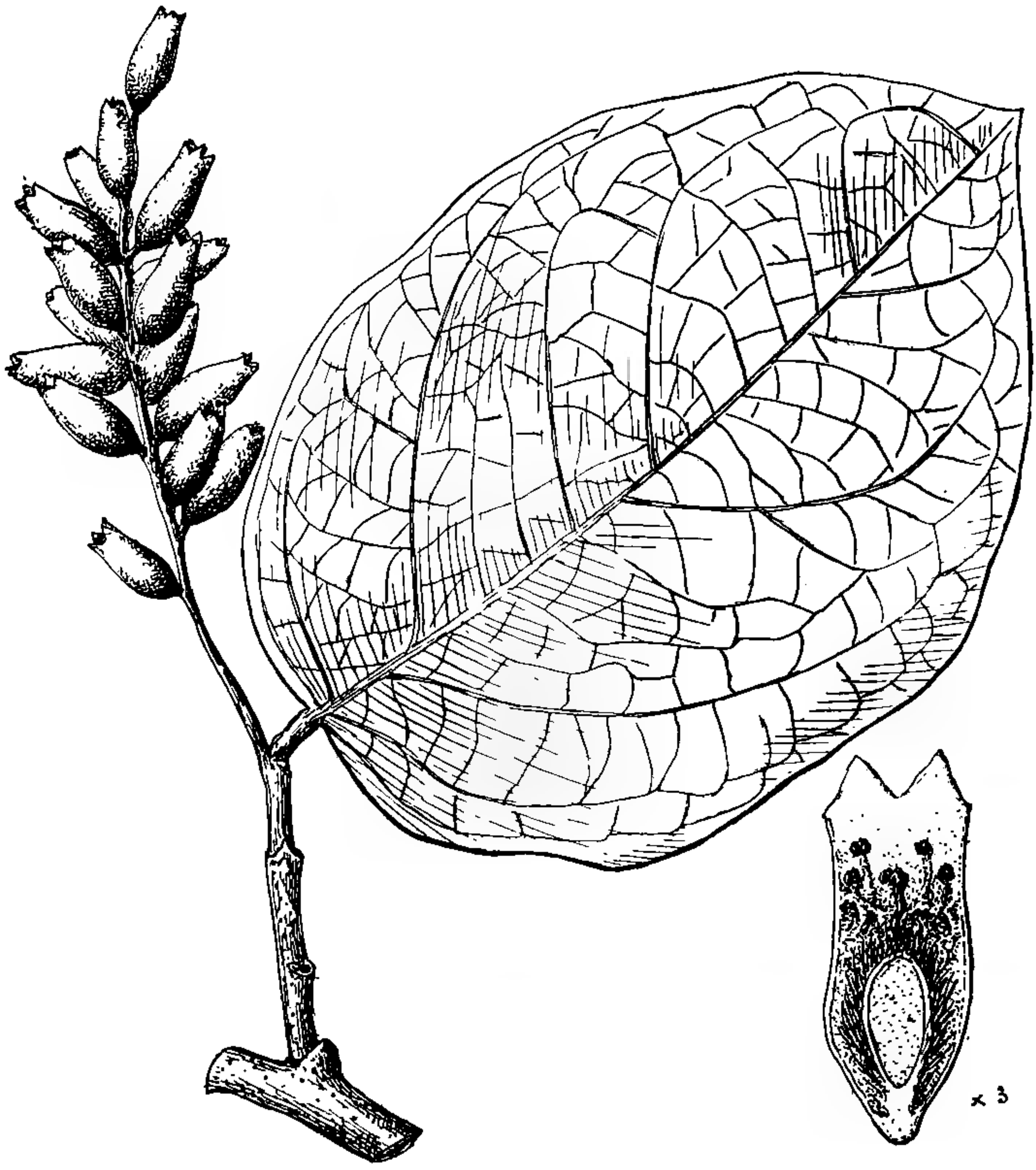

FIG. 14. Flowering branch of the lace-bark tree, *Lagetta Lagetto* (Sw.)

lar and appropriate name of the lace-bark tree. This tree is commonly found in the central and western parts of the island, and is also said to occur in Haïti. It is of a rather straggling

habit, and in its native wilds attains a height of twenty to thirty feet. Its ovate leaves are of a shining light-green, and very attractive. The flowers are fleshy, of a creamy-white color, and borne in long slender spike-like racemes. The tree is a relative of the leatherwood or moosewood, *Dirca palustris*, of our north-eastern woods, belonging to the Thymeleaceae, or mezereon family. In the public conservatories, in houses 4 and 7, will be found specimens of this interesting tree. One of these has flowered for the first time, and the accompanying illustration was drawn from flowers secured from this specimen.

This tree is known to botanists as *Lagetta lintearia*, a name given to it in 1789 by Lamarck, who, recognizing its differences from the old genus *Daphne*, in which it had first been placed, raised it to the dignity of a genus. It was first called *Daphne Lagetto* by Swartz, in 1788. As *Lagetto* is the oldest specific name for this plant, it must be adopted, and so to botanists this tree must be known in future as **Lagetta Lagetto** (Sw.).

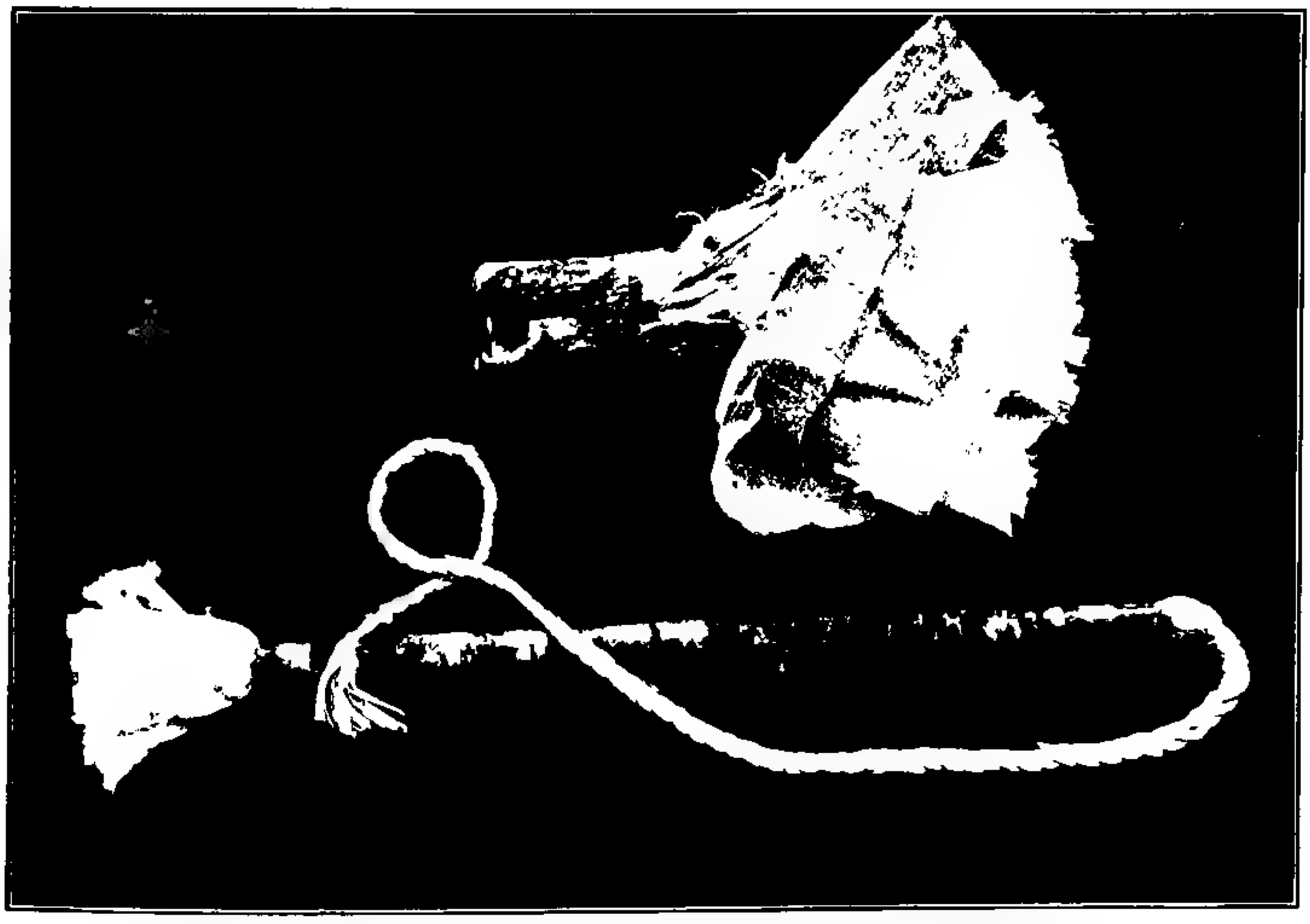

FIG. 15. The upper figure shows a section of wood with part of the outer bark removed, exhibiting the lace-like character of the inner bark; the lower figure represents a whip made from this tree.

The restricted distribution of this tree makes it an object of interest, but its peculiar interest, as was stated above, lies in its inner bark, which has given it the popular name of lack-bark, and which perhaps caused Lamarck to give it the specific name of "lintearia," meaning "of or belonging to linen." This inner bark is made up of fibers arranged in several layers, which may be stretched apart into a loose fabric. This is well shown in the upper figure of the second illustration accompanying this article.

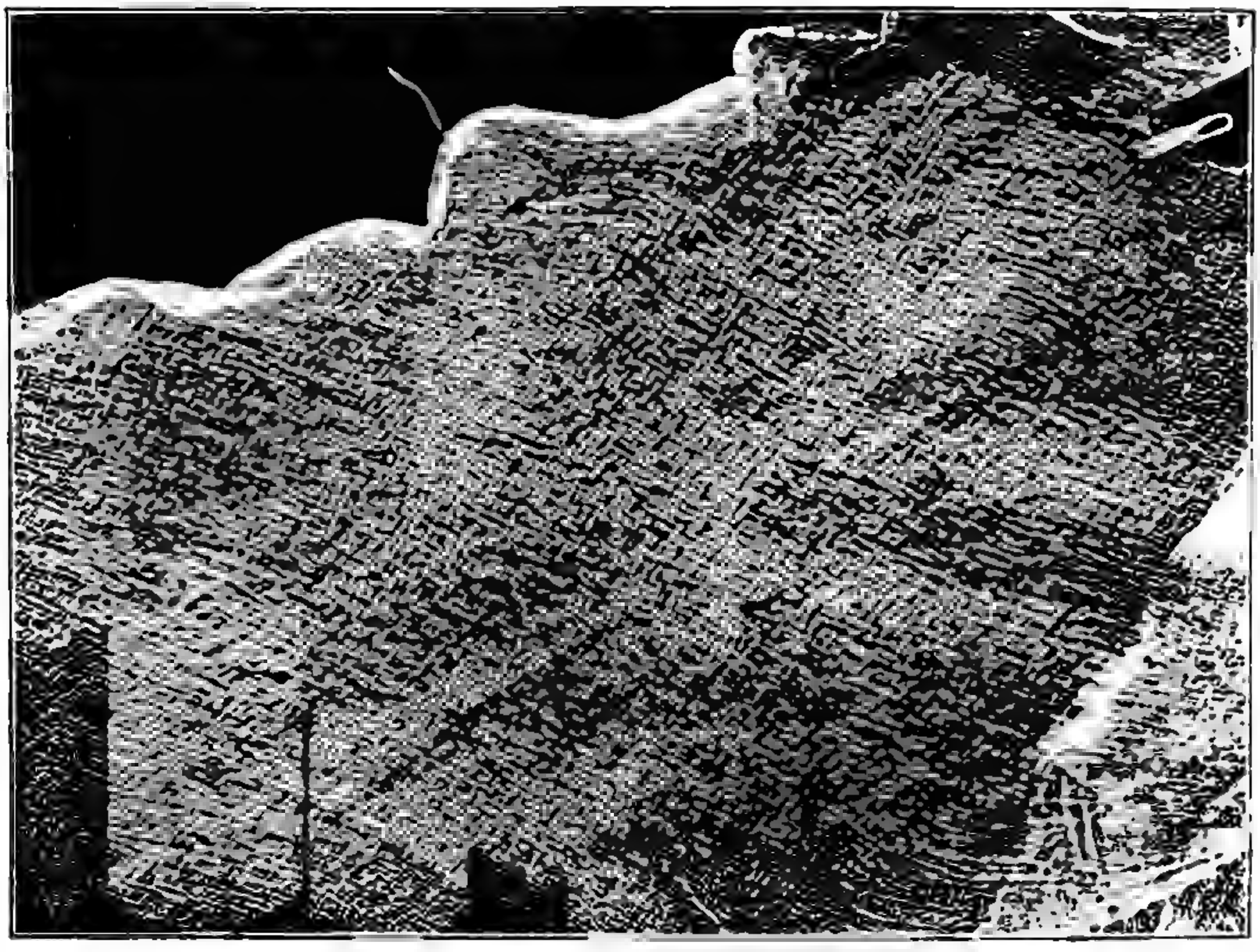

FIG. 16. One of the layers of the inner bark, showing its lace-like texture.

It hardly seems possible that all of this fluffy mass could have once been confined within the outer bark, shown in the other end of the figure. The lace-like character of the inner bark may be seen in the third illustration. In former times, and even now to a less extent, the people employed this bark in making capes, ruffs, bonnets, and even entire lace suits. Its yellowish tinge is removed by bleaching in the sun, frequent applications of water being given. It has, unfortunately, had other uses than the adornment of the person, for during the days of slavery it was manufactured into whips which were used in beating the negro

slaves. A whip of this kind is shown in the lower figure of the second illustration, and is made by removing the woody tissue from the center of the stick for a portion of its length, leaving only the bark for the lash. This bark was also formerly largely used by the Spaniards in the manufacture of rope, and it is said that the Indians employed it for a great variety of purposes.

The first introduction of this tree into cultivation seems to have been at the Royal Gardens, Kew, throu h plants secured by Capt. William Bligh in 1793. These soon died, however, before flowering. The next attempt to introduce it was made about 1844, when Mr. Wilson, curator of the botanical gardens at Bath, Jamaica, sent seeds and young plants to the same institution. Several of the plants thus secured flourished, and one of them in 1849, when eight to ten feet tall, produced flowers and fruit. It seems to be extremely rare in cultivation, at least in this country, and no mention is made of it by Bailey in his Cyclopedia of American Horticulture. I find no record of its having flowered before in the United States.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

During April and May about ten thousand school children, accompanied by their teachers, visited the Garden as a regular school exercise. Suitable lectures and demonstrations were arranged for most of them.

A very valuable collection of Philippine fungi, consisting of between six and seven hundred packets, has recently been sent in by the Bureau of Science, Manila, for determination. Most of these are duplicate specimens and will become permanent additions to the Garden herbarium.

The unusually high rainfall of May, 7.36 inches, has caused the grass on the lawns to grow so rapidly during the month that it has taxed all available men and horses to keep the lawns properly mowed, and certain portions of the lawn area grew very high before they could be reached with the machines.

A joint meeting of the Horticultural Society of New York and the American Rose Society was held at the Garden June 10. An exhibition of lantern slides was given by Mr. Leonard Barron, showing types of roses for various purposes. The usual exhibition was held June 10 and 11.

Volume 22, part 3, of North American Flora appeared June 12, 1908. This pait contains descriptions of the Grossulariaceae by F. V. Coville and N. L. Britton; the Platanaceae by H. A. Gleason; the Crossosomataceae by J. K. Small; the Connaraceae by N. L. Britton; the Calycanthaceae by C. L. Pollard; and the Rosaceae, in part, by P. A. Rydberg.

An important addition to the literature of the fleshy fungi has recently been made by Miss Gertrude Burlingham, now of the State Normal School, Trenton, N. J., who was a student at the Garden and Columbia University from 1905 to 1908, during which time she made an exhaustive study of the Lactariae, or gill-fungi having a milky juice. The results of her studies appeared May 26 as a memoir of the Torrey Botanical Club (**14**: 1–109. *f.* *1–15*. 1908). The descriptions and notes are very complete, and the illustrations, from photographs by the author, are excellent. A feature of great value to collectors is a condensed description of each species when fresh with distinguishing characters to be used in the field. Seventy-one species are recognized in the United States, six of these being described as new.

The process of enriching soil by the growth of crimson clover is being tried this spring on about half an acre of land immediately behind the museum building, and the growth of the crop may readily be watched, the field being in full view from the windows of the systematic museum. The clover seed was sown May 14, the plantlets began to appear above ground on May 20, and the first foliage leaves were developed by May 30. An examination of the little plants on June 2, when they were about an inch high, showed the roots already provided with tubercles containing the organisms which concentrate nitrogen. A complete account of the development of the plant and of the cost of the work on this field will be published in a subsequent number of the JOURNAL.

Construction work is going forward on the fence along the southern boundary of the Garden from the Elevated Railway Station to the Southern Boulevard, on the property line adjoining the land of Fordham University, under a contract of the Park Department with Guidone & Galardi. The rubble stone base is now nearly completed, many of the piers built, and it is expected that the iron fence will be in place and the work finished by mid-summer. This handsome fence replaces an old stone wall, much of which was used in the foundations for the new structure; its completion will make it possible to plant the strip between the path near this boundary line and the fence, in the autumn, after a small amount of necessary grading shall have been done.

Meteorology for May. — The total precipitation recorded for May was 7.36 inches. Maximum temperatures were recorded of 69° on the 5th, 89° on the 17th, 87° on the 24th, and 90° on the 27th; also minimum temperatures of 41.5° on the 5th, 48° on the 13th, 50.5° on the 19th, and 53.5° on the 29th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

200 herbarium specimens from British America. (By exchange with the Geological Survey of Canada.)

2 museum specimens of cocaine hydrochloride. (Given by Messrs. Schieffelin & Company.)

6 specimens of mosses from Cuba. (By exchange with Professor C. F. Baker.)

40 specimens "American Hepaticae," nos. 1–40. (Given by Miss C. C. Haynes.)

1 specimen of fern from Ontario. (Given by Mr. J. H. Faull.)

1 specimen for the food collection. (Given by Dr. H. H. Rusby.)

1 specimen of rust from Nevada. (Given by Dr. P. B. Kennedy.)

1 specimen of *Polygonum aviculare* for the drug collection. (Given by Dr. H H. Rusby.)

3 specimens of mosses from Long Island. (Given by Mrs. N. L. Britton.)

15 specimens of mosses from Central and North America. (By exchange with Dr. J. Röll.)

2 specimens of mosses from Connecticut. (Given by Miss Annie Lorenz.)

97 specimens of ferns from Jamaica. (Collected by Mr. W. Harris.)

2 specimens of ericaceous plants from Nantucket, Massachusetts. (Given by Mr. E. P. Bicknell.)

2 specimens of flowering plants from Long Island. (Given by Mrs. N. L. Britton.)

546 specimens of flowering plants from Guatemala. (Collected by Professor W. A. Kellerman.)

600 specimens of fungi from the Philippine Islands. (In exchange with the Bureau of Science through Mr. E. D. Merrill, botanist.)

PLANTS AND SEEDS.

1 plant of *Cereus flagelliformis*. (Given by Mrs. J. Dorr.)

1 plant of *Nephrolepis exaltata bostoniensis*. (Given by Messrs. F. R. Pierson & Co.)

1 plant of *Sedum* from Mexico. (Given by Prof. F. E. Lloyd.)

4 succulent plants for the conservatories. (By exchange with Mr. Frank Weinberg.)

1 plant of *Ficus lutescens*. (By exchange with the N. Y. Zoölogical Society.)

311 hardy evergreen plants, mainly conifers. (Given by Mr. Lowell M. Palmer.)

485 hardy shrubs and trees. (Purchased.)

17 packets of seed from the Bahamas. (Collected by Mr. Percy Wilson.)

2 packets of seed from Jamaica. (Collected by Dr. N. L. Britton.)

4 packets of seed from the western United States. (Given by Mr. Wilhelm Miller.)

1 packet of seed from South Africa. (Given by Dr. H. H. Rusby.)

3 plants derived from seeds from various sources.

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Vol. IX JULY, 1908 No. 103

JOURNAL

OF

The New York Botanical Garden

EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

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JOURNAL

OF

The New York Botanical Garden

VOL. IX. July, 1908. No. 103.

THE COLLECTIONS OF ALGAE.

Accounts of the collections of the fungi and of the mosses and hepatics, in the possession of the New York Botanical Garden, have already been published in the present volume of the JOURNAL. A description of "The Museum Exhibit of Seaweeds," by the present writer, appeared in the JOURNAL for March, 1904, but since that time there have been considerable additions to the collections of the seaweeds and their fresh-water relatives, in both museum and herbarium, so that some further account of them is perhaps now justifiable.

As is the case with the fungi and mosses, the herbarium of Columbia University, deposited with the Garden in accordance with the terms of an agreement made in 1896, furnishes the nucleus of the collections of algae at the Garden, although this original element is now largely overshadowed by the accessions made on the part of the Garden since the merging of the two institutions. The collections of algae, however, have never received any increment comparable in magnitude and historical importance with that of the fungi through the purchase of the Ellis collection or that of the mosses and Hepaticae through the purchase of the Mitten herbarium. Nevertheless, the collections in this department have been rather notably increased during the past decade by the purchase or gift of several herbaria, by exchange with various collectors and institutions, and by special expeditions sent out by the Garden to Bermuda, Florida, the West Indies, Nova Scotia, and Newfoundland.

The older collections, belonging to Columbia University, include a number of specimens of historical interest, sent to Professor John Torrey by Dr. Jacob Whitman Bailey, who was for many years a distinguished teacher of the natural sciences at the United States Military Academy at West Point, by the elder

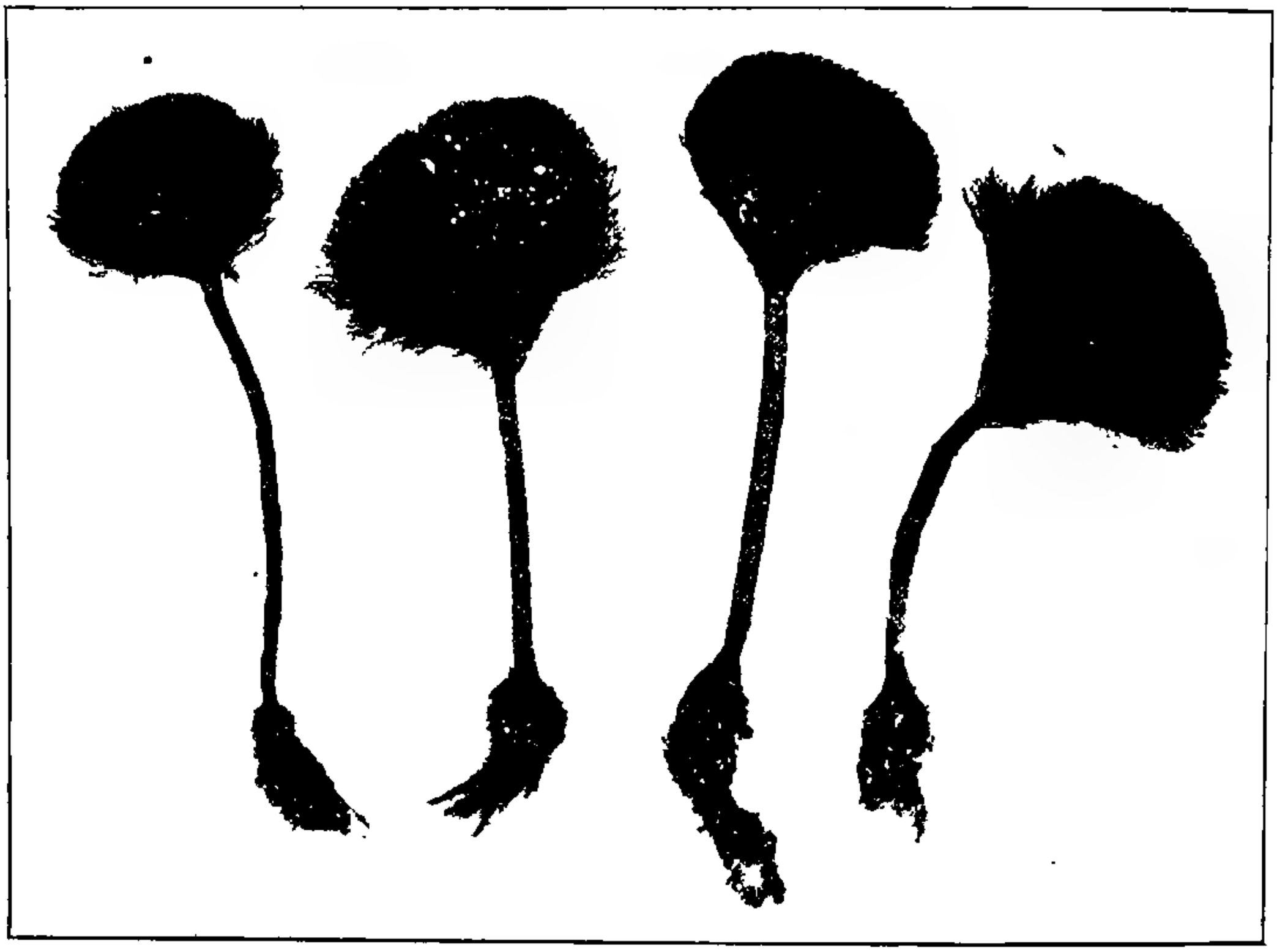


FIG. 17. The Merman's Shaving-brush (*Penicillus capitatus* Lamarck). From Bermuda. One half natural size.

Agardh of Lund, Sweden, one of the founders of modern phycological science, and by several others among the well-known students and collectors of the algae during the early and middle portions of the last century.

If, as is the usual fashion at the present day, the Characeae or stoneworts are to be included among the algae, the first notable accession to our collections in this department after the consolidation of the herbaria of Columbia University and the Garden was the donation by Dr. Timothy Field Allen, in 1901, of his collections of Characeae. Dr. Allen was for many years the leading American student of this group of plants and the collection

FIG. 18. *Rhipocephalus Phoenix* (Ell. & Soland.) Kütz. From the Bahamas. Natural size.

that he brought together is unsurpassed in the United States and probably by only three or four in the world at large. It contained nearly 4,000 sheets which have been incorporated in the Garden herbarium and about twice as many more which have been distributed as duplicates. A more detailed account of the Allen collection was published in the JOURNAL for April, 1901.

The first of the collections of algae, of any considerable size, secured by the Garden through purchase, was that of Rev. George W. Perry, who was, at one time, state geologist of Vermont. This herbarium, bought in 1902, consisted of about 1,400 specimens of seaweeds collected chiefly in Massachusetts or obtained by exchange from California, Europe, and Australia. Another algal herbarium, containing nearly 2,500 specimens, purchased in the same year, was that of Mr.

Horace Averill, of Brooklyn. This was especially rich in the local forms and included also many species obtained by exchange from other parts of the world. A third collection of algae, chiefly marine, purchased by the Garden, was that brought together by the late Colonel Nicolas Pike, who communicated to Professor W.

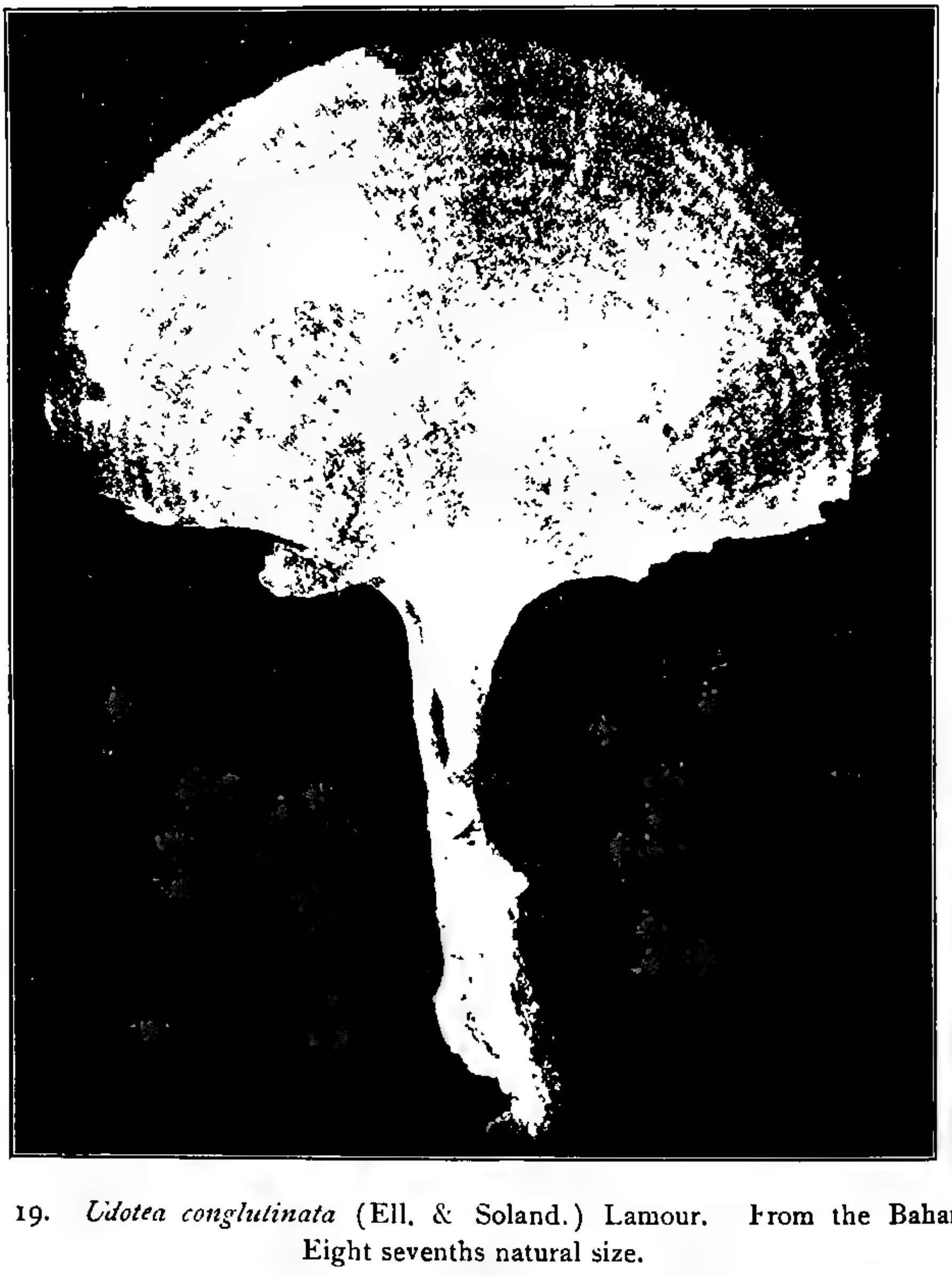


FIG. 19. *Udotea conglutinata* (Ell. & Soland.) Lamour. From the Bahamas. Eight sevenths natural size.

H. Harvey many of the specimens upon which the Nereis Boreali-Americana was based. The Pike collection consisted of a few more than 3,000 specimens. Colonel Pike was United States Consul at Oporto, Portugal, for about ten years, and later, for an

equal period, held a similar position in Mauritius. He made extensive collections of algae at both of these points and his herbarium was particularly rich in Mauritian material. In 1904, the algal collections of Dr. C. L. Anderson, of Santa Cruz, California, numbering about 4,000 specimens, came to the Garden through purchase. Dr. Anderson has been an enthusiastic collector of the marine algae during a long residence in Santa Cruz, and being for many years the leading student of this group of plants on our Pacific Coast, he received for determination many specimens from other collectors in that region, and as he had also exchanged extensively with collectors in the eastern states and in Europe, his herbarium brought elements of much value to the Garden's collections.

But the chief source of the increase in the Garden's algal herbarium in recent years has been from special expeditions sent into the field for the purpose of making collections. In 1900, the writer was enabled through a grant from the department of botany of Columbia University and one from the John Strong Newberry Fund to make collections and studies of the marine algae in Bermuda, on Marthas Vineyard, Mass., and on the coast of Maine. On behalf of the Garden, in 1901, an expedition was made to Nova Scotia and Newfoundland ; in 1902, to Florida ; in 1903, to Porto Rico ; in 1904, to Florida and the Bahama Islands ; in 1905, to the Bahama Islands ; in 1906, to Porto Rico ; in 1906–'07, to Jamaica; and in 1907, to the Bahama and Caicos Islands. These expeditions have resulted in bringing together about 35,000 dried specimens of marine algae, as specimens are commonly counted. Many of these still await critical study and are yet to be incorporated in the herbarium proper. Probably two thirds of them will be used as duplicates for exchange or for distribution to other institutions. The dried specimens are supplemented by a large amount of material preserved with the aid of formaldehyde, etc., such material being, in case of many of the species, very desirable or even essential for showing the natural form and finer details of structure. These fluid-preserved specimens are also freely used in the exhibits in the show-cases of the public museum.

In addition to the specimens obtained by the Garden expedi-

tions or by purchase, many have reached our herbarium in the past few years through exchanges. American (and sometimes foreign) material has been received in this way from W. G. Farlow, F. S. Collins, W. A. Setchell, D. A. Saunders, J. Macoun, W. D. Hoyt, and others; Japanese specimens from K. Okamura and S. Yamanouchi; New Zealand specimens from R. M. Laing;

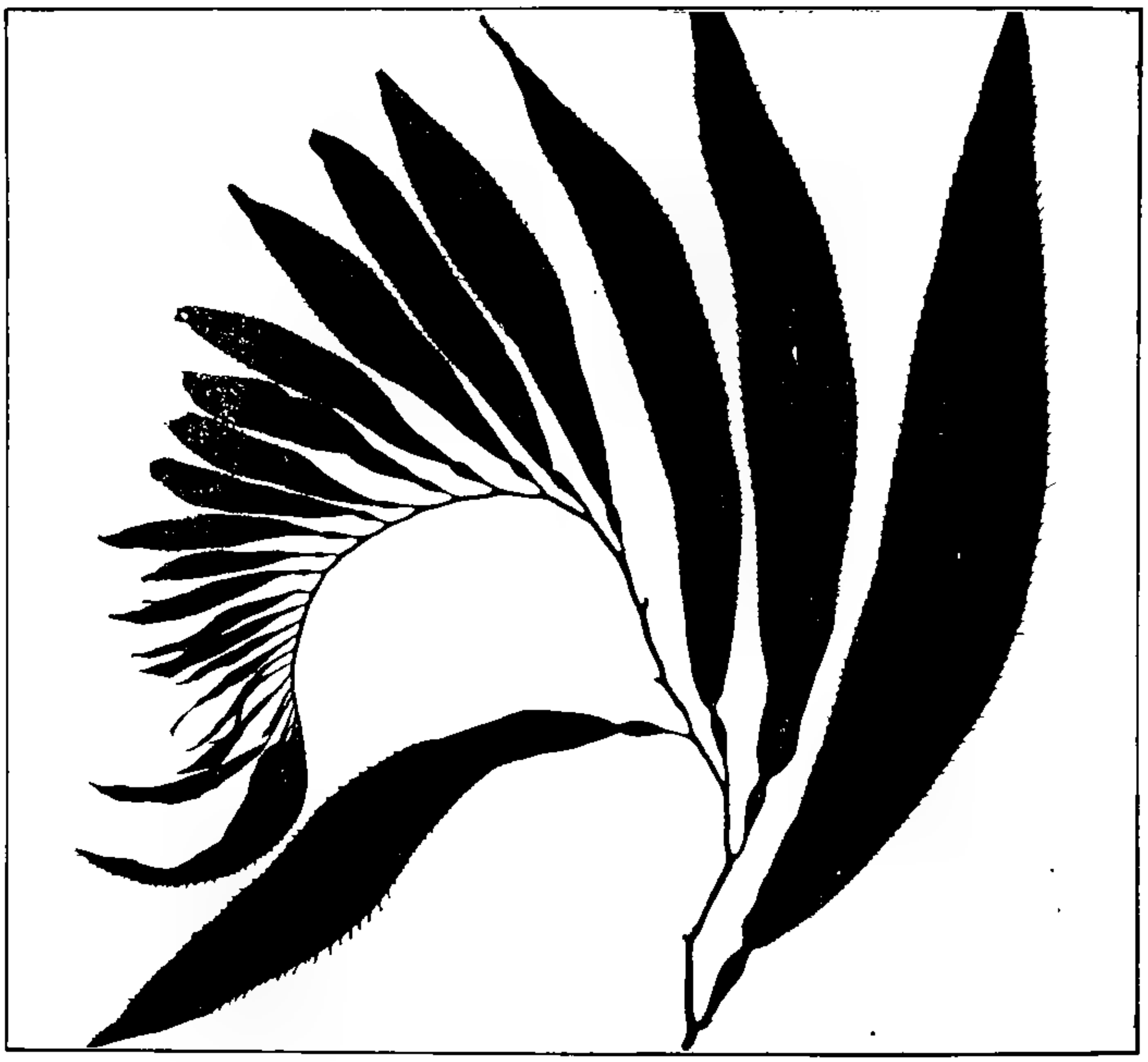


FIG. 20. Growing apex of the Great Kelp [*Macrocystis pyrifera* (Turn.) Ag.]. From a Californian specimen. About one third natural size. This plant is said to attain a length of several hundred feet.

material from Denmark, Iceland, Greenland, the Faeroes, and the Danish West Indies from F. Børgesen; Barbados specimens from A. Vickers; Ceylon specimens from N. Svedelius; algae from the Dutch East Indies from A. Weber-van Bosse; algae from various islands of the South Pacific from Th. Reinbold; fresh-water algae of Sweden from O. Nordstedt; Corallinaceae

from M. Foslie; and there have been exchanges also with the British Museum, the Muséum d'Histoire Naturelle, of Paris, Trinity College, Dublin, the University of Lund, and other institutions. The herbarium contains, also, sets of the principal exsiccatae issued in Europe and America as well as Okamura's Algae Japonicae Exsiccatae. From the duplicates collected on

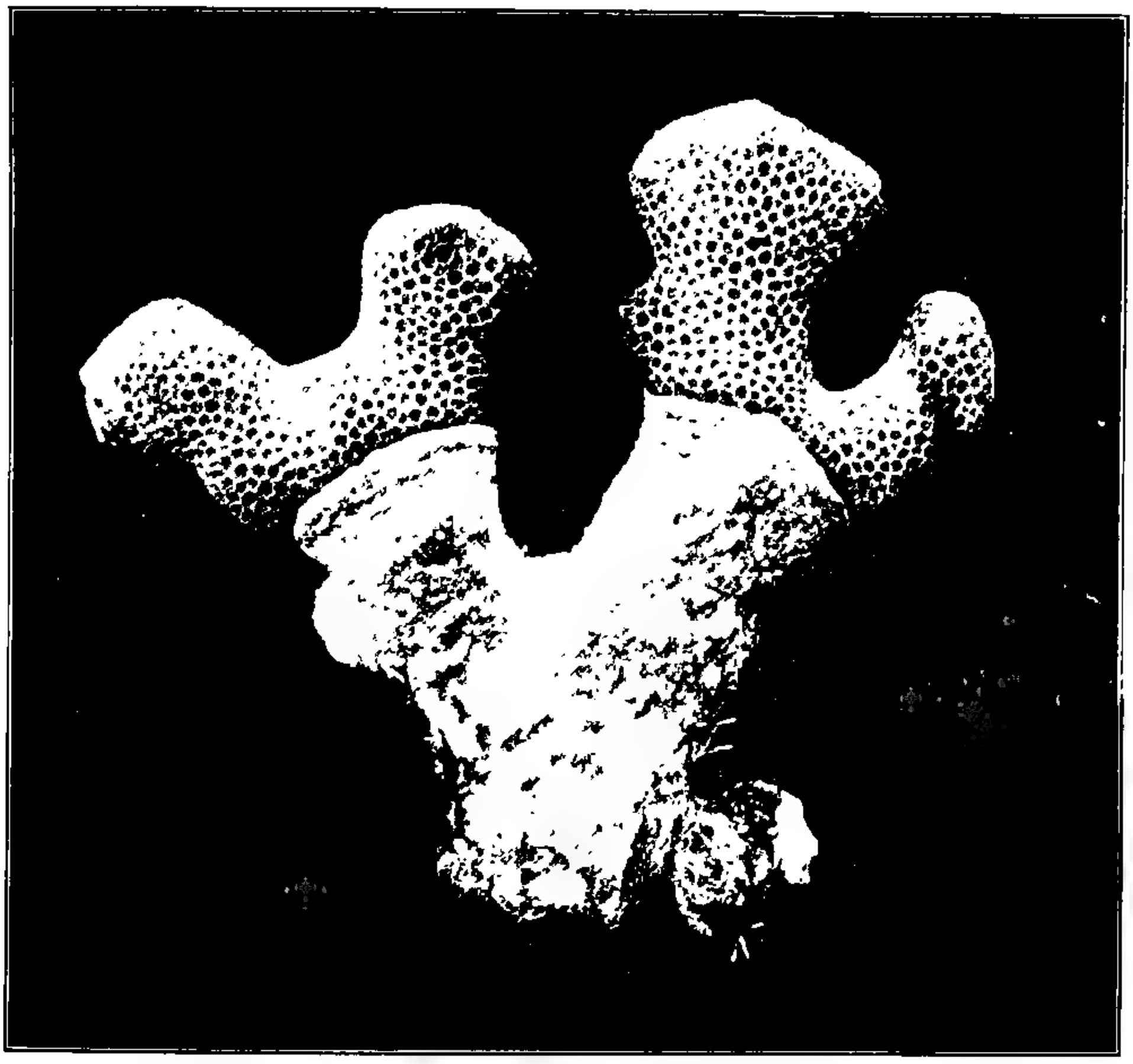


FIG. 21. A coralline alga (*Goniolithon solubile* Fosl. & Howe) encrusting and covering a living coral. From Culebra Island, Porto Rico. Natural size.

various Garden expeditions, several contributions have been made to the Phycotheca Boreali-Americana of Collins, Holden, and Setchell.

In the synoptical section of the public museum, the algae are displayed in fifteen cases and are represented at the present time by about 450 exhibits, including dried specimens, specimens in fluids, drawings, and photographs. Enlarged figures and photo-

graphs are used for showing microscopic forms and also the details of structure of selected types among the larger kinds. A few of the smaller sorts are shown under microscopes. The exhibit of tropical species and of corallines in the synoptical cases is perhaps especially noteworthy. An account of the corallines was published in the JOURNAL for July, 1905. In addition to the general systematic exhibit, the seaweeds and their relatives in the local flora are represented by specimens in swinging frames, though, at the time of writing, this feature is only partially installed, including thus far the algae of the "red" and "brown" groups and the stoneworts.

MARSHALL A. HOWE.

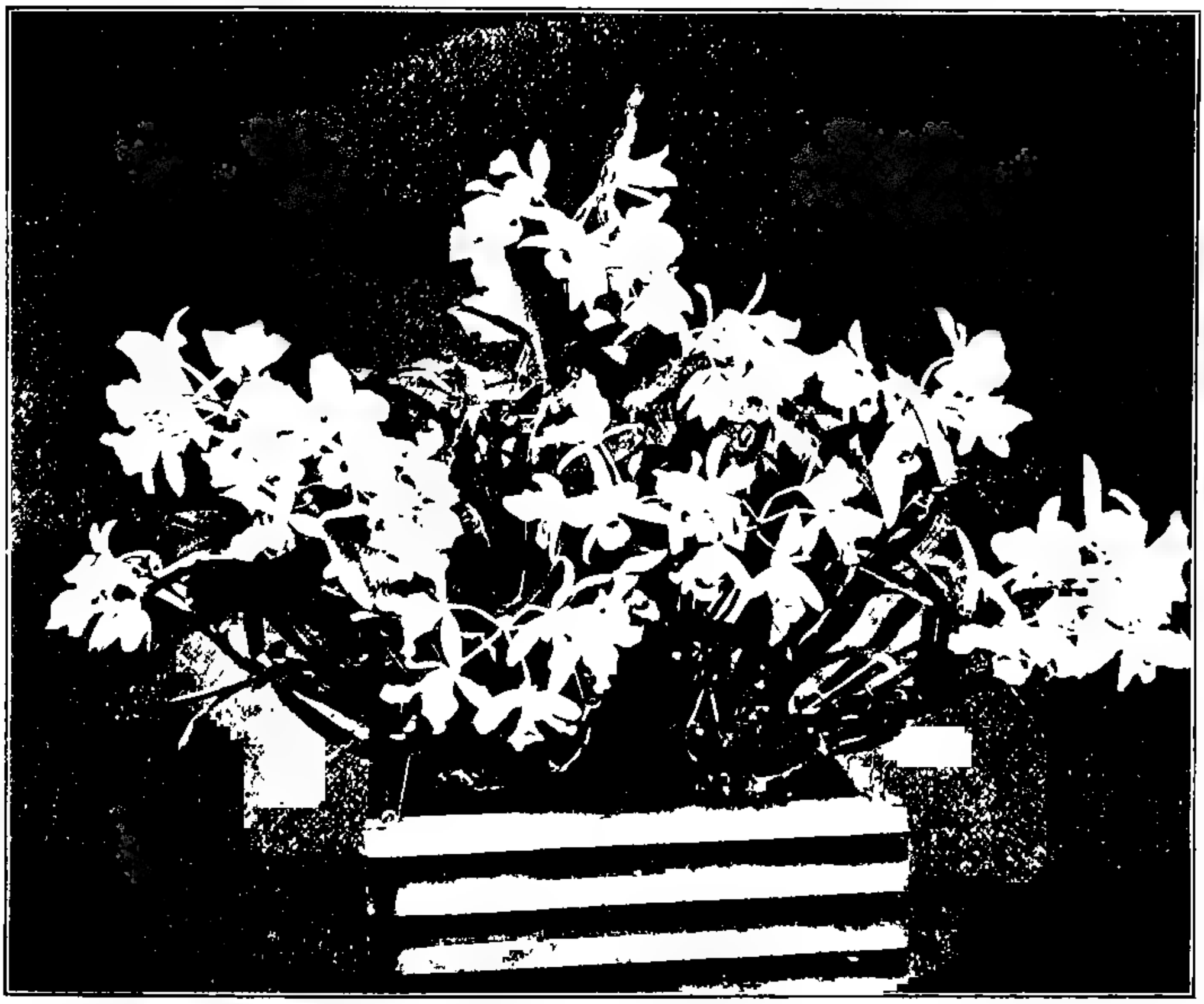
AN UNUSUAL SPECIMEN OF THE "FLOR DE SAN SEBASTIAN."

The plant from which the accompanying illustration was made was secured by Mr. W. R. Maxon, who made explorations for the New York Botanical Garden in Costa Rica in the early part of 1906. *Cattleya Skinneri*, of which this plant is an unusually fine specimen, is said to occur from southern Mexico to Costa Rica, and has even been reported from the island of Trinidad. It was originally found in Guatemala, where it was discovered many years ago by Mr. Skinner, in whose honor it is named, and was said by that gentleman to be found almost exclusively in the warmer parts of the country. It is known there as "Flor de San Sebastian," and is eagerly sought for by the people as an ornament for the shrines of their favorite saints. It is not obtained, however, without great difficulty, for it is said to grow in the tops of the highest trees in the forests, a habit which makes it very hard to find and harder to collect, unless the tree on which it grows happens to be uprooted by a storm.

This use of the plant for religious decoration might well be appreciated by one who had seen in full flower, in the public conservatories, this large plant brought back by Mr. Maxon. Imagine a plant with a spread of about three feet bearing in great profusion large masses of flowers of a deep rose-purple. At the

height of its perfection, about the middle of May, this plant bore twenty-two flower clusters, each cluster containing from four to eight flowers.

Mr. Maxon secured the plant in a garden at Cartago. Upon its arrival here it was placed in a sunny position near the roof in a house of medium temperature and humidity, a treatment to which it responded readily as the above record of its flowering will show.



This *Cattleya* is closely related to *C. Bowringiana*, a native of Honduras, which differs in being of larger growth, with flowers of a somewhat different color, and especially in its time of flowering, which is in the fall instead of in the spring.

The genus *Cattleya* was named by Lindley in honor of Mr. Cattley, a great lover and successful cultivator of these plants in the early part of the nineteenth century. It is distributed mainly from southern Mexico to Brazil, and is represented by about twenty species. It is the various species of this genus which fur-

nish the greater part of the large showy orchids so much used for decorative purposes. As the species vary in their time of flowering, it is possible, by judicious selection, to have some of these showy flowers in evidence at all times of the year.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton attended the special summer meeting of the American Association for the Advancement of Science at Hanover, New Hampshire, and the annual botanical field "symposium" at Georgetown, Delaware.

Professor G. W. Wilson, of Upper Iowa University, Fayette, Iowa, has been assigned a research scholarship at the Garden for two months, beginning July 1.

Dr. W. A. Murrill visited the State Museum at Albany in June to examine the collection of fungi of the family Boletaceae, which probably contains more original specimens than any other collection of its kind in America.

Signs have been placed at the principal entrances to the hemlock grove with the following instructions: "This grove is situated near the southern limit of the region in which hemlock trees grow naturally near the coast, and its preservation is a matter of special interest. As the roots of the hemlock trees are near the surface of the ground and the soil is thin, trampling over the ground may cause the death of the trees. Visitors are therefore requested to keep to the paths and trails and to abstain from injuring the trees in any way. If this caution is not observed the use of the forest will have to be materially restricted."

Following the extremely wet weather of May, a drought of unusual duration and severity has been experienced which cannot fail to be of considerable injury to vegetation. The rainfall of June was just one inch at the Garden, and no rain has fallen during July up to the fourteenth of the month. Not alone the damage to vegetation is to be regretted, but the driveways have suffered severely. Lawns have been browned in many places, but this will not be permanent because a few inches of

rain-fall will cause the grass to grow again. The injury has been particularly great to shrubs and trees planted this spring, although they have been watered as much as possible.

Meteorology for June. — The total precipitation recorded for June was 1 inch. Maximum temperatures were recorded of 86.5° on the 7th, 89.5° on the 8th, 93.5° on the 21st, 93.7° on the 22d, 92.5° on the 29th; also minimum temperatures of 44.5° on the 7th, 55.5° on the 12th, 47.5° on the 17th, and 55° on the 27th. The mean temperature for the month was 69.1°.

ACCESSIONS.

LIBRARY ACCESSIONS FROM MAY 1 TO JUNE 30, 1908.

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COLLETT, HENRY. *Flora simlensis.* Calcutta, 1902. (Given by Miss Anna Murray Vail.)

Commercial relations of the United States with foreign countries for the years 1880–81, 1896–97, 1900, 1902, 1903, 1906. Washington, 1883–1907. 10 vols. (Given by the Department of Commerce and Labor.)

ENGLER, HEINRICH GUSTAV ADOLPH & PRANTL, KARL ANTON EUGEN. *Die natürlichen Pflanzenfamilien.* Lieferung 1–230. Leipzig, 1887–1907.

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HENDERSON, PETER. *Practical floriculture.* New York, 1873. (Given by Dr. John Hendley Barnhart.)

KNUTH, PAUL. *Handbook of flower pollination.* Vol. 2. Oxford, 1908.

KUPFER, ELSIE. *Studies in plant regeneration.* New York, 1907. (Deposited by the Trustees of Columbia University.)

Maryland Geological Survey. Vol. 6. Baltimore, 1906. (Given by Dr. Arthur Hollick.)

OKAMURA, KINTARO. *Icones of Japanese algae.* Vol. 1, parts 1–6. Tokyo, 1907–08.

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SAIDA, KŌTARO & SAKURAI, HANZABURŌ. *Catalogue of botanical specimens in the natural history department of the Imperial Museum.* Tokyo, 1891. (Given by Miss Anna Murray Vail.)

SCHULZ, GEORG E. F. *Natur-Urkunden: Pflanzen.* Berlin, 1908.

SCHULZ, GEORG E. F. *Natur-Urkunden: Pilze.* Berlin, 1908.

[SMITH, JOHN DONNELL.] *Icones plantarum centrali-americanarum.* [Baltimore, 1908.] (Given by the author.)

STRASBURGER, EDUARD ADOLF, AND OTHERS. *Text-book of botany.* Ed. 3. London, 1908.

MUSEUMS AND HERBARIUM.

50 specimens "Phycotheca Boreali-Americana," Fascicle XXX. (Distributed by Messrs. Collins, Holden, and Setchell.)

4 specimens of mosses from Connecticut. (Given by Miss Annie Lorenz.)

7 specimens of mosses from the Chiricahui Mountains, Arizona. (By exchange with Mr. J. C. Blumer.)

214 specimens "Crytopgamae Formationum Coloradensium." (Distributed by Professor Frederic E. Clements.)

220 specimens of mosses from Costa Rica and Guatemala. (Distributed by Mr. E. Levier.)

61 specimens of flowerless plants from Bermuda. (Collected by Mr. Stewardson Brown.)

4 specimens of drugs. (Given by Dr. H. H. Rusby.)

7 Syrian food products. (Given by Mr. Siyd Mikel Albestany.)

5 specimens of Chinese food products. (Given by Dr. H. H. Rusby.)

2 specimens of *Bovista pila* from Vermont. (Collected by Dr. M. A. Howe.)

1 specimen of rust from Long Island, New York. (Given by Dr. H. D. House.)

4 specimens of woody fungi for the conservatories. (Collected by Dr. W. A. Murrill.)

22 specimens of polypores from the Adirondack Mountains. (Collected by Dr. W. A. Murrill.)

112 specimens of drugs. (Given by Messrs. Merck & Company.)

100 specimens "Bryotheca Exotica." (Distributed by Mr. E. Levier.)

PLANTS AND SEEDS.

8 plants for woody nursery. (Given by Mr. H. S. Adams.)

3 cactuses from Colorado for conservatories. (Given by Mr. T. D. A. Cockerell.)

1 plant of *Arisaema Stewardsoni* for herbaceous grounds. (Collected by Mrs. E. G. Britton.)

1 plant of *Dryopteris Goldiana* × *marginalis*. (Collected by Mr. R. C. Benedict.)

38 chrysanthemums for nursery. (By exchange with the Bureau of Plant Industry.)

257 plants derived from seed from various sources.

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Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations carried out in the Garden. Free to all members of the Garden; to others, $3.00 per volume. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Vol. II, Nos. 6–8, 518 pp., 30 plates, 1901–1903. Vol. III, Nos. 9–11, 463 pp., 37 plates, 1903–1905. Vol. IV, Nos. 12–14, 479 pp., 14 plates, 1905–1907. Vol. V, No. 15, 105 pp., 1906; No. 16, 88 pp., 17 plates, 1906; No. 17, 115 pp., 1907. Vol. VI, No. 19, 114 pp., 1908.

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Vol. 22, part 3, issued June 12, 1908, contains descriptions of the family Grossulariaceae by F. V. Coville and N. L. Britton, the Platanaceae by H. A. Gleason, the Crossosomataceae by J. K. Small, the Connaraceae by N. L. Britton, the Calycanthaceae by C. L. Pollard, and the Rosaceae (pars) by P. A. Rydberg.

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JOURNAL

OF

The New York Botanical Garden

EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

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JOURNAL

OF

The New York Botanical Garden

VOL. IX. August, 1908. No. 104.

COLLECTING FUNGI AT BILTMORE.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: With your permission, I accepted an invitation from Dr. C. A. Schenck, Forester of the Biltmore Estate, to spend two weeks in July at his summer home in Pisgah Forest for the purpose of studying the fungi of that region. My report on these studies is prefaced with a brief account of this interesting estate.

The estate of Mr. George W. Vanderbilt is situated in Henderson and Transylvania counties in the western part of North Carolina to the south and southwest of Asheville, a region famous for its superb climate and magnificent scenery, many of the mountains being over 5,000 ft. in height and a few, the highest in the eastern United States, attaining an elevation of nearly 7,000 ft. By far the greater part of the 130,000 acres in the estate is mountain land covered with virgin forest, the arable land being situated in the valleys of the Swannanoa and French Broad rivers near the village of Biltmore.

Biltmore House, modeled after the famous *chateaux* of the Loire, was completed nearly twenty years ago, and with its rich furnishings and splendid landscape effects that have only recently been brought to maturity, it is easily the finest country seat in America. Biltmore village, two miles from Asheville and twenty-four hours by rail from New York, has the appearance of an exceedingly neat and comfortable old English village, with houses in half-timbered style built of cement mixed with sand and

pebbles from the adjacent river bottoms and molded on frames of wood and wire. Near Biltmore are the nurseries, the dairy, the swine and poultry ranges, and other adjuncts of farm life for which the estate is famous.

Mr. Vanderbilt usually spends about six months of the year at Biltmore House. He lives quietly, being devoted to literature and to the study of natural history, and his guests are usually selected on account of personal achievement rather than because of social distinction. Occasional visits are made with friends to his hunting lodge on Pisgah and to the excellent trout streams in various parts of the estate. Once a year the favored families of Asheville and vicinity are entertained together at Biltmore House ; and during the Christmas holidays every family on the estate is invited there to a feast, after which each man, woman and child receives a suitable gift.

The effect of this magnificent estate on the people of western North Carolina, combining as it does the artistic and the practical, must have been very marked in the past twenty years, being no less than that of a great educational institution diffusing knowledge of facts and methods, giving employment and encouragement to many, and depending upon and developing the energy, experience and devotion of those employed.

The forest lands are in charge of Dr. C. A. Schenck, who succeeded Mr. Gifford Pinchot many years ago as forester of the estate. Forestry at Biltmore is twenty years old, the oldest of its kind on American soil. According to Dr. Schenck, the problems are totally different from those in Germany, where he received his training. Since coming to Biltmore, he has extended and elaborated the plans of Mr. Pinchot and has in many cases followed original lines of development. Lumbering operations are conducted on an extensive scale, and the denuded hills and abandoned fields near Biltmore, comprising about 2,000 acres, have been planted with a variety of useful trees, such as white pine, pitch pine, hemlock, oak, chestnut, maple, ash, yellow poplar, walnut, basswood, locust and cherry. It is possible to see in a short drive all stages of these plantations from young trees just removed from the seed beds to trees twenty years of age.

The Biltmore Forest School, organized ten years ago, is located at Biltmore from November to April, and is removed to Pisgah Forest for the remainder of the year. The forenoon of each day is regularly devoted to lectures and the afternoon to excursions for observation and the practical application of forestry methods employed on the estate. Twenty-four young men are now enrolled as students, and as many more are on the waiting list.

Pink Bed Valley, the home of the forester and the forest school from the middle of May to the first of November, is in Transylvania County, twelve miles from Pisgah Forest Station in the direction of Cold Mountain, The Balsams, and Pisgah Ridge. The valley is about eight miles long, with an elevation of 3,000 to 3,500 ft., and the surrounding ridges that completely shut it in, except at two points, reach an elevation of a thousand feet more. The forest is composed of hardwood species, chestnut, oak and tulip predominating, while pitch pine occurs sparingly on the dry ridges and white pine and hemlock along the streams. Minor hardwoods are hickory, black gum, basswood, sourwood, birch, maple, black locust, butternut, ash and Fraser's magnolia. *Rhododendron*, *Kalmia* and *Azalea* are exceedingly abundant, forming impenetrable thickets in many places, which, when in flower, are visible from a distance as pink-colored masses or "beds." *Gaylussaccia ursina* and *Vaccinium corymbosum* are also very abundant in the undergrowth. Balsam and spruce forests are found at an altitude of five to six thousand feet on summits easily reached from Pink Bed Valley.

When I reached the valley, on July 13, a season of wet weather had brought out quantities of fleshy fungi, which, with the assistance of Dr. H. D. House, were collected in abundance. Many of the thinner forms dried readily in the sun, but the more fleshy agarics and all of the *Boleti* had to be dried by artificial heat, excellent facilities being provided for this purpose by Dr. Schenck. This collection, with the notes I was able to obtain from the study of specimens in the field, should be especially valuable to the student of American fungi because of the pioneer work done in North Carolina by Schweinitz and Curtis, the former having published in 1822 a list of 1,373 species of fungi found in

this state, many of them described as new, and the latter having sent nearly 2,500 species from North Carolina to Berkeley in London for determination, a large percentage of which were published as new species under the joint authorship of Berkeley and Curtis. The condition of all these early collections, even when they still exist, together with the brevity of the descriptions drawn from them originally, makes it necessary in many cases to study recent collections in order to properly understand the relationships of a given species.

Among the gill-fungi collected, species of *Lactarius*, *Russula*, *Amanita*, *Amanitopsis*, *Cortinarius*, *Marasmius*, *Collybia*, *Mycena*, *Cantharellus*, *Pleurotus*, *Crepidotus* and *Hygrophorus*, were quite common, while many other genera were represented more or less sparingly.

Lactarius volemus and *L. piperatus* were very abundant, while *L. lignyotus*, *L. fuliginosus*, *L. torminosus*, and several other species were frequently seen. *Russula* was found in various colors, white, yellow, red, olive and green, *R. emetica*, *R. foetida* and *R. virescens* being common. All of the species of *Cantharellus* usually found in the eastern United States were represented, *C. cibarius*, *C. aurantiacus* and *C. floccosus* being common. *Amanita phalloides* was rather common, varying from pure white to blackish in color, while *A. caesarea*, *A. solitaria*, *A. rubescens* and certain other species were several times collected. *Amanitopsis vaginata* and *A. farinosa* were exceedingly common. *Clitocybe laccata* was just beginning to be abundant, and *C. illudens* was found once. *Cortinarius* was represented by about six species, several of them common. *Paxillus rhodoxanthus* was very common along the roadsides and was frequently mistaken for a *Boletus*, the upper surface being very similar to certain members of this genus. *Collybia radicata*, usually so abundant, was very rare, but *C. dryophila* was more common than usual; *C. platyphylla* and a few other species were also collected. *Mycena* was represented by several of the smaller species, *Omphalia* by *O. campanella*, *O. epichysium* and others, *Pleurotus* chiefly by *P. ostreatus*, and *Hygrophorus* by *H. conicus* and a few other brilliantly colored species. The rosy-spored agarics were

represented by a few species of *Clitopilus*, *Entoloma* and *Leptonia*. *Flammula*, *Inocybe*, *Hebeloma*, *Claudopus* and *Crepidotus* were also collected, the last being quite abundant in *C. versutus*.

Clavaria was more abundant than I have ever seen it before, it being one of the few genera of fungi that can exist and thrive in such dense shade as that of *Kalmia* and *Rhododendron* overtopped by forest trees. Several species of *Clavaria* were collected for the herbarium, and certain of the larger forms were gathered almost daily during my stay for table use. Other fungi made use of in this way were *Lactarius volemus*, two or three species of *Russula*, *Pleurotus ostreatus*, *Lycoperdon gemmatum*, *Cantharellus cibarius* and *Hydnum repandum*. It was too early in the season for a number of excellent autumnal species of gill-fungi and for a sufficient quantity of many of the edible *Boleti*. The species to be avoided at this time in the collections for the table were chiefly *Amanita phalloides* and most other species of *Amanita*, *Lactarius rufus*, *Russula foetida*, *Russula emetica* and *Cantharellus aurantiacus*. A very common branched species, *Lachnocladium Schweinitzii*, resembling *Clavaria* in form, was easily distinguished by its exceeding toughness and flexibility.

The Hydnaceae collected were nearly all terrestrial species, *H. imbricatum*, *H. repandum* and *H. putidum* being abundant. *Calostoma cinnabarium* was the most abundant member of the Gastromycetes, while *Lycoperdon* and *Geaster* were sparingly represented in three or four woodland species. The season for *Morchella* had past, but *Spathularia velutipes*, *Leotia lubrica*, *Sarcoscypha coccinia*, and a few other Discomycetes were fairly abundant.

Two species of *Cordyceps* were collected, *Cordyceps militaris* in several specimens on pupae of a species of moth buried under moss and leaf-mold, and an undetermined species on the larva of a large moth which had fallen among mud and leaves by the roadside. Several specimens of *Tremella mycetophila*, parasitic on *Collybia dryophila*, were found. The wild crabs were all affected with *Gymnosporangium*, and the wild plum and cherry trees were frequently found covered with *Plowrightia*. *Exobasidium* was rather common on species of *Vaccinium* and *Azalea*. Many of the best known parasitic fungi were rare, as might be ex-

pected in such a locality, but wood-destroying kinds, both saprophytic and parasitic, mostly belonging to the Polyporaceae, were quite abundant.

The principal wood-destroying species observed were, *Porodaedala Pini*, on pitch pine; *Pyropolyporus igniarius*, on species of oak; *Pyropolyporus Robiniae*, common on all the black locust trees seen; *Fomes populinus*, chiefly on maple; *Elfvingia megaloma*, common on several hard-wood species; *Ganoderma Tsugae*, on hemlock; *Laetiporus speciosus*, common on oak and a few other hard woods; *Grifola Berkeleyi*, at the base of oak and chestnut trunks, attached to the roots; *Inonotus hispidus*, on oak; *Coriolus versicolor*, on various hardwoods; *Fistulina hepatica*, on chestnut; and *Hydnum septentrionale*, on black gum. *Daedalea quercina* was not seen. As beech and birch were very rare in the valley, no specimens of *Elfvingia fomentaria* were collected, although it must be common at other elevations. *Armillaria mellea*, a very destructive root-rot, was known to be present in abundance, but the sporophores were only beginning to appear.

The chestnut canker was not seen in North Carolina. The chestnut tree is of immense importance in the Biltmore Forest, being cut in great quantities annually for lumber and for tannin extract. It is said that the successful employment of chestnut wood pulp, now a waste product from the extract factory, for the making of paper, would increase the value of Pisgah Forest, with its wealth of chestnut timber, one hundred per cent. This tree is very sensitive and is dying in many parts of the forest from the effects of the chestnut borer and the disturbance of the natural forest conditions, but, fortunately, this new disease, so abundant and destructive about New York, has not yet been introduced at Biltmore.

Besides the polypores mentioned in the above list of wood-destroying species, *Aurantiporus Pilotae* was twice collected on decayed oak logs, *Cyclomyces Greenei* was found in two places along the roadsides attached to underground roots, and *Microporellus dealbatus* was common in open thickets on the roots of various members of the heath family. *Coltricia cinnamomea* was very abundant on the banks along the roads and trails, while *C. perennis* was found only once and *C. obesa* twice.

The Boletaceae, while not as abundant in July as a little later in the season, were well represented by a number of very interesting species, and particular attention was given to this group, which can be profitably studied only from fresh specimens. Over one hundred special collections of *Boleti* were made, comprising about forty species, and all of these were critically studied and described in the field. A list of these, with notes of special interest, will be published elsewhere.

In closing, I wish to express my appreciation of the cordial reception tendered me by Dr. and Mrs. Schenck and the young men of the Forest School, and of the efforts of everyone to make my visit delightful as well as successful. I wish also to thank Mr. Vanderbilt for the privileges I enjoyed on the estate.

Respectfully submitted,

W. A. MURRILL,

Assistant Director.

OUR DUTY TO THE PARKS.

Every privilege brings with it a duty. Every good thing that we have ought to have two effects upon us. It should cause us to take care of it. It should make us willing to let others have the good of it as well as ourselves.

We all love the great and beautiful parks of our city — those wonder places, those stretches of country sweetness and freshness and greenness and beauty, set right down in the busy city streets to refresh and cheer and charm us. Many a city child owes its good health to the trees and streams and fountains in the parks. And almost all city children love these pleasant playgrounds.

And what duty does this lovely gift bring with it? Surely we should do our best to keep the parks at their fairest, surely we should obey all the rules that are made to protect them, surely we should be willing that those who come and see them after we have gone to our homes should find them as beautiful and pleasant as we did.

Bronx Park is perhaps the most marvellous of all our city parks, because it is instructive as well as charming. And yet,

last Saturday, I saw two little girls wantonly tearing off great bunches of the flowering phlox that the city had carefully nurtured for us all to enjoy together.

They were hurting the bushes, and stealing the flowers. I say "stealing" because no one person has any right to take and keep for himself the things that belong to all of us together.

If any of you, my boys and girls, see anyone devastating the people's garden, I want you to be good citizens, and go right up to them and make them stop.

If they will not obey you, tell them that you will call a gardener; and, if that does no good, call one.

It is your duty to the city of New York.

—THE BRONX HOME NEWS, Friday, July 31, 1908.

A COLLECTION OF VINES.

The recent labelling of the collection, and the construction of adjacent paths, has practically made available to the public the beautifully installed and interesting collection of vines. The secluded nature of its position, and lack of comprehensive labels, has tended to obscure a plantation that has developed into one of the most picturesque features in the Garden.

The Viticetum is just west of the border of the Hemlock Forest, and winds for about three hundred feet along the ridge to the east of the Economic Garden. At present the collection consists of thirteen families, seventeen genera, and thirty-four species, represented by about seventy specimens. The plants are supported by a substantial arbor of rough-hewn logs, and there is a pathway underneath so that people may walk from one end to the other. The vines are planted along both sides of the arbor and some of them have already run wild over the top. During the spring and summer the walk underneath is a beautifully shaded cloister with a charming vista looking down into the hemlock woods.

Beginning at the southerly end, one of the first of the larger plants is the Dutchman's pipe of the eastern states, belonging to

the birthwort family. It is a splendid vine for covering porches, its large kidney-shaped leaves affording a dense shade. The plant is also interesting as being a northern representative of a genus, *Aristolochia*, that in tropical countries produces perhaps the largest flowers known, except in *Rafflesia*. In this native species, however, they are small and half hidden by the leaves. They are of a curious pipe-like shape, and it is from this resemblance that the plant has derived its common name.

Near the Dutchman's pipe is *Brunnichia*, of the buckwheat family, one of the few native representatives of the group that is enough of a trailer to warrant its appearance in such a collection as this. It is little more than a climbing herbaceous perennial.

Just above this is a collection of the familiar *Clematis*. None of the plants are very large as yet, and *Clematis vitalba*, or "Traveller's Joy," of England, is scarcely what one would expect from reading descriptions of this historic vine. It was called "Traveller's Joy" by Gerarde in his Herbal (1597), and it is interesting to read what he said then of one of the most beautiful vines of rural England: "These plants have no use in Phisicke, as yet found, but are esteemed onely for pleasure, by reason of the goodly shadowe which they make with their thicke bushing and clyming, as also for the beautie of the flowers and the pleasant sent (*sic*) and savour of the same."

The "Akebi Kadsura" (*Akebia quinata*) from China and Japan is a graceful climber with a 5-foliolate leaf, and curious flowers with three petals. It is a member of the Voqui family (Lardizabalaceae), and, except a single plant at the conservatory, it is the only representative of the family in the collections of the Garden. The fruit is eaten by the Japanese, and Chinese native druggists make an emollient from the sap that is used in bronchial troubles. The orientals of San Francisco use a vegetable decoction, a large part of which is made from the juice of "Akebi," that is credited with being the usual panacea for all ills; much after the fashion of similarly exploited occidental remedies. The flowers are fugitive, being of a dark red color and partly hidden by the profusion of leaves.

Passing by the *Actinidia* or "Saru Nasi," the fruits of which

are eaten by the Japanese, we come to the group of wistarias. Of all the vines suitable for arbors or porches these are perhaps the most beautiful. The delicacy of their color and the harmony and grace of their flower-clusters will always make them most desirable for decorative planting. They are particularly well suited for city homes, for they seem to have the faculty of taking good care of themselves under apparently adverse conditions.

The Japanese honeysuckle (*Lonicera japonica*) is a particularly sweet-smelling climber and well merits its popularity as a cover for fences and trellises. It was introduced into England by the Dutch East India Company in the early part of the last century and has spread throughout the civilized world.

But space forbids an account of all the vines in the collection. However, mention must be made of the grapes, bittersweets, and Virginia-creepers, all represented by good-sized plants. There is also a fine plant of the trumpet-creeper, just now showing an abundance of scarlet and orange flowers.

There is still room for expansion in the collection, and it is ultimately planned to include all the vines that will stand the variations of our climate. The collection will then be one of great interest botanically, and will also serve to illustrate the horticultural possibilities of vines at present little used for decorative purposes.

NORMAN TAYLOR.

SUPPLEMENT TO THE MERCK COLLECTION OF PROXIMATE PRINCIPLES OF PLANTS.

Messrs. Merck & Co. have supplemented their valuable and important gift of last year, consisting of several hundred vegetable principles, with a collection of most of the crude vegetable substances from which the former are derived. This addition comprises one hundred and twenty articles, many of them of considerable rarity. While many of the substances are represented by but a single constituent, others possess several. Opium heads the list with twelve constituents, mostly alkaloids. Cinchona follows with eight, amygdala and ergot with five each, and coca,

dita, digitalis, sabadilla, turpentine, soap-bark, and belladonna have four each.

The new acquisition necessitates an entire rearrangement of the original collection. It has heretofore been classified according to the chemical nature of the products, and in this form has attracted much attention from visitors during the year, especially from students. By the new arrangement, the crude articles stand in botanical sequence, and each is surrounded by the principles pertaining to it. Suitable pedestals and labels are now being prepared for each of these groups. The collection now comfortably fills an entire section of cases, and may be found in the northwest corner of the Economic Museum.

NOTES, NEWS AND COMMENT.

Dr. Homer D. House, who was connected with the Garden and Columbia University in 1902–04 and again in 1907–08, has recently accepted the position of associate director in the Biltmore Forest School.

Dr. Raymond H. Pond, research scholar at the Garden at various times during 1905, 1906, and 1907, has been appointed biologist of the Metropolitan Sewerage Commission of New York, to investigate important biological problems connected with New York Harbor.

Mrs. Cornelius Van Brunt has recently given the Garden an assortment of over five hundred museum bottles, which will be used chiefly for preserving in alcohol or formalin the flowers of rare orchids as they appear in the conservatories.

Mr. H. von Türckheim, the veteran botanical collector of Coban, Guatemala, visited the Garden August 13 and 14, on his way to Europe. He began collecting for Mr. John Donnell Smith nearly twenty-five years ago, and the Garden has been receiving his collections, directly or indirectly, for the past ten years or more. Practically all of his collecting work was done in Guatemala.

The severe drought which was experienced during June and the first part of July was broken by the showers at the middle of July, and there has been sufficient rainfall ever since, although the rainfall of the summer is still considerably below the average. Grass has grown again on the burnt portions of lawns and banks and, while newly planted shrubs were considerably set back, the actual loss has not been very great, much less indeed than was feared. This experience has emphasized the need for an extension of the water-supply system, and it is planned to accomplish this by the expenditure of a portion of the recent additional appropriation for construction made by the city.

An additional construction appropriation of $25,000, voted by the Board of Estimate and Apportionment June 26, 1908, adopted by the Board of Aldermen July 21, and approved by His Honor

the Mayor August 4, will be expended in the continuation of construction of driveways and paths, principally on the eastern side of the grounds, in the completion of the grading operations necessary at the museum building, in the extension of the system of water-supply and drainage, and for minor works. All the earth and rock to be excavated at the museum building is required for filling and for the telford foundation of roads and paths, so that the same money will effect two pieces of work, as has been the case in nearly all the grading operations hitherto accomplished, a result made possible by following the original plan of development approved by the Board of Managers in December, 1896. It is now planned to complete the driveway system and to build at least an additional mile of paths.

Meteorology for July.— The total precipitation recorded for July was 3.29 inches. Maximum temperatures were recorded of 92.5° on the 5th, 99.5° on the 6th and 12th, 95.5° on the 19th and 20th, 89.5° on the 27th, 28th and 31st; also minimum temperatures of 63° on the 1st, 52.5° on the 9th, 54° on the 17th, and 63° on the 26th. The mean temperature for the month was 76°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

47 specimens of flowering plants from central New York. (By exchange with Dr. H. D. House.)

9 specimens of flowering plants from Jamaica. (By exchange with the Department of Agriculture, Jamaica, W. I.)

21 specimens of flowering plants from Long Island. (Given by Dr. R. M. Harper.)

45 specimens of cacti and Crassulaceae from North America. (By exchange with the U. S. National Museum.)

8 specimens of mosses from Scotland. (Given by Mr. J. Hunter.)

42 specimens of mosses and hepatics from the Philippine Islands. (Collected by Professor A. D. E. Elmer.)

33 photographs, mostly of cacti. (By exchange with the U. S. National Museum.)

50 specimens "Hepaticae Europaeae Exsiccatae, series V, nos. 201–250." (Distributed by Dr. Victor Schiffner.)

5 specimens of flowering plants from Nantucket, Mass. (Given by Mr. E. P. Bicknell.)

3 specimens of *Nopalea*. (By exchange with U. S. National Museum.)

50 miscellaneous specimens from Jamaica. (By exchange with the Department of Agriculture, Jamaica, W. I.)

27 specimens of flowering plants from the Philippine Islands. (By exchange with the U. S. National Museum.)

5 specimens of drugs. (Given by Dr. H. H. Rusby.)

11 specimens of mosses from Westchester County, New York. (Collected by Mrs. N. L. Britton.)

18 specimens of mosses from Northern Black Hills, South Dakota. (By exchange with Miss F. Grace Ernst.)

PLANTS AND SEEDS.

7 plants from Jamaica for conservatories. (Collected by Dr. and Mrs. N. L. Britton.)

10 filmy ferns from Jamaica. (Collected by Mr. William Harris.)

1 plant of *Sedum Poloseni* for conservatories. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

18 succulents for conservatories. (By exchange with Mr. F. Weinberg.)

19 orchids from Costa Rica. (By exchange with Mr. J. C. Zeledon.)

1 *Opuntia* for nursery from Colorado. (Given by Dr. T. D. A. Cockerell.)

1 seedling of *Sequoia* for conservatories. (Given by Mr. G. N. Tricoche.)

2 plants for herbaceous collections. (Collected by Mr. F. Weinisch.)

1 plant of *Leea* for conservatories. (By exchange with Fairmount Park, Philadelphia.)

1 packet of seed of *Astragalus Blakei* from Vermont. (Given by Mr. W. W. Eggleston.)

2 packets of seeds of economic plants. (Given by Dr. H. H. Rusby.)

53 plants derived from seed from various sources.

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EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

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REPORT ON BOTANICAL EXPLORATION IN PANAMA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: In accordance with your instructions, I left New York January 25, 1908, for the Republic of Panama, in order to make collections for the Botanical Garden, especially outside of the canal zone. I was delayed by illness for two weeks at Kingston and did not reach Colon until February 16, where I remained over Sunday, taking the 8:40 A. M. train the next day for Panama, a ride occupying over three hours, owing to the many stops at stations along the route of forty-eight miles.

The entire canal zone, as well as Colon and Panama, was so greatly improved since the American occupation that I scarcely recognized it as the same region passed over a few years before. After getting located at one of the many hotels in Panama, I called on Pinel Brothers, to whom I had a letter of introduction from the Colon agent of the Royal Mail Steam Packet Company, to inquire about transportation to Pacific coast ports within the Republic of Panama. From the information kindly given me I concluded to make my headquarters at Penonome for a time, the town being some twenty miles inland, in the vicinity of mountains, and some one hundred miles west of the canal zone. As the next boat for Porto Posada, the nearest landing to Penonome, did not leave for several days, I put in some time collecting near the town.

Panama bay has a tide of sixteen or eighteen feet, and at low

water numerous rocks project one third to one half mile from shore. Here I spent parts of two days looking for algae, but with little success, only six or eight species being obtained. These were all attached to rocks, and I observed no specimens drifting in along shore. Doubtless some of the many islands a few miles out in the bay would prove better collecting ground.

FIG. 23. Porto Posada, the nearest port to Penonome.

Another day was passed in climbing Ancon Hill, just outside of the town and 600 feet above the ocean. The hill is partly covered with rather small timber and brush, with grass-covered slopes intervening, but at this season the grass was dry and brown, while many of the trees and shrubs were more or less leafless and wilted from the hot sun. However, a few species were just coming into bloom, and quite a number of others were bearing fruit. Mosses and lichens, of the larger forms at least, were scarce, and I did not secure a specimen of either.

On February 22, I boarded the small steamer "Cocle" bound

for Penonome. We left Panama about 8 A. M. and, after making short stops at the island of Taboga and the Port of San Carlos, came to anchor at midnight off the mouth of the Sarotee River. At daylight we began steaming up the river, which proved to be a stream of moderate size with but little current and with low, often heavily wooded banks, the mangrove being one of the

FIG. 24. Palms near Penonome. The one in the center is the oil-nut palm; the others are cocoanut palms.

most conspicuous trees. White and blue herons, parrots, and sandpipers were common, otherwise we noticed little animal life. We reached Porto Posada in about two and one half hours, and found it to consist of a small wharf with a couple of open sheds a few rods away, from which a nearly straight road led to the town of Penonome, some twelve or fourteen miles distant. Mosquitoes were in swarms and no fresh water apparently to be had for miles, except that on the boat. I had ordered a saddle horse to take me to the town, but, finding only some ox-carts for the freight, concluded to walk and do some collecting along

the way. This proved rather more of an undertaking than I had counted on, having had almost nothing to eat since the day before at noon. There was no food or water to be had on the way and having stopped here and there along the road to collect, I reached the town seven hours later, dry and hungry, with a well-filled press.

Penonome is situated at the upper side of a rather level savanna at the foot of hills that reach down from low, more or less timber-covered mountains beyond. The place is only a hundred feet or two above sea level, with the nearer hills some six or eight hundred feet higher. It proved to be a town of some importance, being the capital of the province, and consisted of several hundred native inhabitants, quite a number of Spaniards, some Frenchmen, and at least one American and one German. The streets, though narrow, seemed quite clean, and the connected houses, which were built in long narrow blocks, were mostly entirely without yards and with doors opening directly to the streets on either side.

Many of the trees about town seemed to be cultivated, among them the cocoanut and oil-nut palm. A species of *Anacardium*, called Maranyon, was common, and furnished an edible fruit, or rather an edible pedicel to the flat, stony fruits that were used by the children in a game somewhat like marbles. A species closely related to this was indigenous along the river near by, and proved to be one of the largest and commonest trees of the region. Of the plant families, the Papilionaceae were best represented. Species of the Melastomaceae were also abundant, while climbing shrubs and small trees belonging to the Polygalaceae were in sight almost everywhere, with handsome clusters of pink and purple flowers. Orchids were fairly common in favorable localities but only two or three particularly noticeable species were found. Among other genera of this family two species of vanilla were obtained.

I lived during my residence in the town with Mr. Hugo Henne, the proprietor of a hotel for travelers, and he not only gave me excellent board, but every assistance possible to make my stay profitable. I remained there from February 23 to March 23,

making in the meantime two trips with Mr. Henne to his rubber estate, " Bismark," situated some twenty miles up the river at an elevation of perhaps 2,000 feet. Low mountains surrounded the plantation on nearly all sides and the climate was much moister than below, light showers occurring frequently, which kept everything green, in strong contrast to the parched lands at Penonome. My visits, of scarcely two days duration on each trip, were quite insufficient to fully explore even the immediate vicinity.

FIG. 25. Road leading to Old Panama.

On March 23, I left Penonome and rode to Porto Posada, where I found the steamer waiting for high tide in order to proceed down the river. We finally started at five o'clock and reached Panama about eight o'clock the next morning. I now wished to collect on the other side of the canal toward the Colombian border, and at length arranged with Mr. Pinel, the agent of the only regular steamer running to that region, to take me to the Gulf of San Miguel and up the Tuira River about forty-five miles to a small town known as El Real.

While waiting for the next boat I made a short visit to the ruins of Old Panama, five or six miles along the coast and eastward from the present town. Most of the city was built of wood and was wholly burned by Morgan when he sacked the place in 1671, but the old stone tower, a bridge or two, and various foundations still remain, surrounded by a tangle of bushes, trees and banana plants. I carried a plant press along, but brought

FIG. 26. Part of sea wall in Old Panama.

back only a species of lichen, *Ramalina*, that quite covered some of the low bushes. Many of the trees and shrubs were leafless and not suitable for specimens.

On April 1 I took the steamer "Cana" for El Real. We left Panama about 6:30 P. M. and reached the Gulf of San Miguel at nine o'clock the next morning, passing many small volcanic islands and reefs, which, in connection with the tidal currents, make navigation rather dangerous at times. The lower gulf seemed six or eight miles wide in places and the tide runs up

the Tuira River some fifty or sixty miles from the coast. As we ascended the river we found the banks heavily wooded and saw numerous birds, and shortly before reaching El Real we passed quite a number of alligators swimming or floating along the shores, looking much like rough logs well sunken in the water.

Knowing little about the country, I had intended to go to Yavisa, a small native town well in the interior of Darien, but the officers of the boat told me that there I would be farther from mountains than at El Real. Accordingly, on the recommendation of the captain, the agent of the Darien Gold Mining Company agreed to let me stay at their station, called Marraganti, a few miles farther up the river, and here I remained for over a week, collecting on both sides of the Tuira. The region in general was low, there still being six feet of tide in the river, with heavy forests covering much of the country. One tree in particular was very conspicuous, growing in groups, with a round, smooth trunk seven or eight feet in diameter, and attaining a height of probably 150 feet or more. At this season it was leafless but bore clusters of winged fruits four or five inches in diameter, which, when blown off by the wind, appeared from a distance like a flock of birds. Another quite common and very large tree was evidently related to the Brazil nut, *Bertholletia*, and bore round, very thick, woody capsules seven or eight inches in diameter, packed with triangular nuts.

I remained at this station nine days, but wished to collect at higher elevations, and was fortunate in meeting Mr. Lachszyrma, Manager of the Darien Gold Mining Company, who came down to Marraganti while I was there. He kindly consented not only to transport myself and baggage to the mining camp, but to furnish room and board for a time under the same conditions as for an employee of the company. It took me from April 11 to April 16 to reach the camp known as "Cana." The first day's travel was up the river in a dug-out canoe, or *peragua*, with two skilled natives to pole and paddle the boat, which contained not only my own baggage but some 1,200 pounds of iron rails as well. The river banks we passed were mostly low and in places, for a mile or so at a stretch, showed four of the most per-

fectly arranged zones of vegetation that I have ever seen. In the background was a growth of *Cecropia*, a graceful tree perhaps fifty feet high, with slender spreading branches ; next below came a dense belt of chara (*Gynerium*), or sometimes in place of this false banana (*Heliconia*) ; next, on the steeper bank, another coarse grass, but much lower than *Gynerium ;* and, near the water, a low grass forming a rather dense sod.

FIG. 27. Tower of Old Panama.

We reached the first company station above Marraganti the second afternoon out, having passed the night on a sandbar without trouble either from mosquitoes or other insects. At this station I remained over one day to collect, but the region was very dry and quite like that lower down stream. On April 14 I proceeded to the next station, called " Cituro." The greater part of this distance was made in the cabin of a forty-ton engine balanced over a two-foot gauge track. As the railway was not quite completed to the station, I walked the remaining two or

three miles with a plant press. The country about this station seemed considerably higher and moister than down the river, with open grassy hills here and there, causing a decided change in the character of the vegetation. I collected the part of an afternoon here and the next morning mounted a mule for the third and last station, called "Paca," before reaching my destination. The distance was only about thirteen miles and I had an-

FIG. 28. The base of the tower shown in the previous figure.

other afternoon in which to do some collecting. The morning following I started afoot for Cana, ten miles distant, with only my plant press, the baggage to be forwarded the next day. A great many interesting plants were found along the road and my press was easily filled some time before I reached the town.

Cana is situated at the base of the Espirito Santo Mountains, at an elevation of some 2,000 feet, the mountains reaching an elevation of about 7,000 feet and being well covered with forests

to their summits. It is claimed that from one of the higher peaks of this range, Balboa first saw both the eastern and western oceans some four centuries ago.

April 17 being Good Friday, no freight arrived in camp and my baggage including dryers and a good many plants in press, did not reach me until the afternoon of the next day. I was afraid many of the specimens would be spoiled, but fortunately only a few had to be thrown away. The following morning, with plenty of papers and dryers on hand, I was able to get out and do some collecting, but good weather did not last much longer, for on April 21 the wet season started in abruptly with heavy showers, and my last collecting of any extent was done on April 27, although a few specimens were obtained at various times in May, whenever I was able to get out.

Probably between 900 and 1,000 species were collected on the entire trip. Of the lower forms, Dr. Murrill has already examined the small collection of fungi and reports some 24 species. Of these, 17 are common tropical or world-wide species. Of the remaining 7, 6 species are interesting or rare, while one is perhaps undescribed, although collected before in Cuba.

I have rather carefully looked over the true mosses and find some 30 species. Of these, 24 are found in South America, including 2 that are world-wide in tropical regions and 4 that are also found in North America. The remaining 6 species are at present apparently known only from Central America, three of these being probably undescribed.

Respectfully submitted,

R. S. WILLIAMS,

Assistant Curator.

AUTUMN LECTURES, 1908.

Lectures will be delivered in the lecture hall of the museum building of the Garden, Bronx Park, on Saturday afternoons, at four o'clock, as follows :

Oct. 17. "Edible and Poisonous Mushrooms," by Dr. W. A. Murrill.

Oct. 24. "Wild Autumnal Flowers and Fruits," by Dr. N. L. Britton.

Oct. 31. "Letchworth Park and the Falls of the Genesee," by Mr. George V. Nash.

Nov. 7. "Plant Distribution as Interpreted by Geology," by Dr. Arthur Hollick.

Nov. 14. "Botanical Cruises in the Bahamas," by Dr. M. A. Howe.

Nov. 21. "
," by Dr. H. H. Rusby.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5: 34 train from the Botanical Garden Station, arriving at Grand Central Station at 6 : 04 P. M.

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

NOTES, NEWS AND COMMENT.

Professor John Dearness, of London, Ontario, visited the Garden on August 29. Professor Dearness has been an enthusiastic collector of fungi in Canada and has contributed largely to the Ellis Collection, now deposited in the herbarium of the Garden.

Mr. H. S. Jackson, of the Delaware Agricultural Experiment Station, spent over two weeks at the Garden in September completing his list of the fungi of Delaware. The Ellis collection contains a large number of specimens collected in Delaware by Mr. Commons.

Dr. Britton entertained the members of the Garden Staff on August 19, on the occasion of the departure of Dr. C. Stuart Gager for the University of Missouri. Dr. E. O. Hovey, of the

American Museum of Natural History, and Mr. C. William Beebe, of the New York Zoölogical Park, were also present and gave interesting accounts of their recent explorations in Tropical America.

On August 28, 1908, a thousand or more dead English sparrows were found on the grounds of the Garden, especially in the shrubbery about the elevated approach and along the railway line on the west side. In one small area 620 dead birds were picked up where they had fallen from the shrubs at night. Their death was due to the heavy cold rain of August 25 and 26 accompanied by a night temperature of 50° or lower. The premature cold was too great for the young birds as yet poorly supplied with feathers. The death of sparrows in other places about the city was noted in the papers at this time. The English sparrow is a decided nuisance on the grounds and about the buildings of the Garden, especially in the conservatories and around the eaves of the museum building. It will be interesting to note the effect of this wholesale slaughter upon the number of birds next year.

Meteorology for August. — The total precipitation recorded for the month was 7.19 inches, 6 inches being recorded for the week beginning August 22. Maximum temperatures were recorded of 92.5° on the 11th, 94° on the 14th, 88° on the 19th, and 81.5° on the 30th; also minimum temperatures of 69.5° on the 8th, 59.5° on the 11th and 16th, 50.5° on the 21st, and 45.5° on the 28th.

ACCESSIONS.

LIBRARY ACCESSIONS FROM JULY 1 TO AUGUST 31, 1908.

BUSEMANN, L. *Der Pflanzenbestimmer.* Stuttgart, 1908.

CHUN, CARL. *Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898–99.* Zweiter Band, erster Teil, Lieferung 1–2; Zweiter Band, zweiter Teil. Jena, 1905–07.

GISEVIUS, PAUL. *Das Werden und Vergehen der Pflanzen.* Leipzig, 1907. (Given by the Trustees of Columbia University.)

GORDINIER, HERMON CAMP, & HOWE, ELLIOT CALVIN. *The flora of Rensselaer County, New York.* Troy, 1894. (Given by Dr. H. C. Gordinier.)

HANNIG, GEORG. *Der Friedhof und seine Kunst.* Berlin, 1908.

HAYEK, AUGUST VON. *Flora von Steiermark.* Erster Band, Heft 1. Berlin, 1908.

Index Kewensis. Suppl. 3. Oxonii, 1908.

JUNK, WILHELM. *Indices nominum trivialium ad: Linnaei Species plantarum, ed. I.* Berlin, 1907.

JUNK, WILHELM. *Linnè's Species ptantarum, editio princeps, und ihre Varianten.* Berlin, 1907.

KENTER, J. *Morphologisch-biologisches Skizzenbuch.* Ausgabe A: Botanik. Arnsberg, 1908.

KRONFELD, E. MORITZ. *Anton Kerner von Marilaun: Leben und Arbeit eines deutschen Naturforschers.* Leipzig, 1908.

LELIEVRE, J. F. *Nouveau jardinier de la Louisiane.* Nouvelle-Orleans, 1838. (By exchange with Howard Memorial Library.)

LINDAU, GUSTAV. *Nylanderi Synopsis Lichenum index.* Berlin, 1907.

NORDSTEDT, CARL FREDRIK OTTO. *Index Desmidiacearum.* Supplementum. Lundae, 1908.

SCHLECHTENDAL, DIEDERICH FRANZ LEONHARD VON, LANGETHAL, CHRISTIAN EDUARD, & SCHENK, ERNST. *Flora von Deutschland.* 3te Aufl. Jena, 1845–72. 21 vols.

Switzerland, Departement des Innern. Baum- und Waldbilder aus der Schweiz. Erste Serie. Bern, 1908.

TSCHIRCH, ALEXANDER. *Die Chemie und Biologie der pflanzlichen Sekrete.* Leipzig, 1908.

TSCHIRCH, ALEXANDER. *Handbuch der Pharmakognosie.* Lief. 1. Leipzig, 1908.

VINCENT, FRANK. *The plant world: its romances and realities.* New York, 1899 [1897]. (Given by Dr. J. H. Barnhart.)

WAGNER, MAXIMILIAN. *Biologie unserer einheimischen Phanerogamen.* Leipzig, 1908.

WALLIS, E. J. *Illustrations of the Royal Botanic Gardens, Kew.* (Kew, 1908.) (Given by Dr. N. L. Britton.)

WESTERMAN, WILHELM. *De tabakscultuur op Sumatra's oostkust.* Amsterdam, 1901. (Given by the Trustees of Columbia University.)

WINKLER, HANS. *Parthenogenesis und Apogamie im Pflanzenreiche.* Jena, 1908.

MUSEUMS AND HERBARIUM.

2,500 specimens from Panama. (Collected by Mr. R. S. Williams.)

16 specimens of woody fungi from the Philippine Islands. (By exchange with the Bureau of Science, Manila, P. I., through Mr. E. D. Merrill, Botanist.)

750 specimens of fleshy fungi from Pisgah Forest, North Carolina. (Collected by Dr. W. A. Murrill and Dr. H. D. House.)

25 specimens of fleshy fungi from Falls Church, Virginia. (Collected by Dr. W. A. Murrill.)

2 specimens of Hepaticae from New Hampshire. (Given by Miss Annie Lorenz.)

1 specimen of *Epipactis viridiflora* from New York. (Given by Mr. George V. Nash.)

6 specimens of flowering plants from Westchester Co., New York. (Given by Mrs. N. L. Britton.)

100 specimens, "Bryotheca Exotica, Ser. I." (Distributed by Mr. E. Levier.)

21 specimens of mosses from Central America. (Distributed by Mr. F. Renauld.)

1 specimen of *Amblystegium hygrophilum* from Pennsylvania. (By exchange with Dr. George N. Best.)

8 specimens of *Zygodon* from England. (By exchange with Mr. H. N. Dixon.)

1 specimen of moss from Guatemala. (Given by Mr. H. von Türckheim.)

1 specimen of *Albugo Froelichiae* (cotype). (Given by Professor Guy West Wilson.)

16 specimens of *Peronosporales* from India. (Given by Professor Guy West Wilson.)

1 specimen of *Tyromyces palustris* from Miami, Florida. (Given by Professor Ernst A. Bessey.)

3 specimens of *Boleti* from Stockholm, Sweden. (Given by Mr. L. Romell.)

98 specimens of fleshy fungi from Pisgah Forest, North Carolina. (Given by Dr. H. D. House.)

20 specimens of fleshy fungi from Herradura, Cuba. (Given by Professor F. S. Earle.)

6 specimens of fungi from Corvallis, Oregon. (Given by Professor E. R. Lake.)

41 specimens of fungi mostly from North Carolina. (Given by Professor G. F. Atkinson.)

30 specimens of woody fungi from Seattle, Washington. (Given by Professor T. C. Frye.)

4 specimens of sac-fungi from Utah. (Given by Professor I. D. Cardiff.)

4 specimens and two photographs of *Lepiota Americana* from Redding, Connecticut. (Given by Professor A. L. Treadwell.)

PLANTS AND SEEDS.

1 plant of *Echinocactus* sp. for conservatories. (Given by Mr. H. Dennerstein.)

1 plant of *Cattleya* sp. from Guatemala for conservatories. (Given by Mr. H. von Türckheim.)

1 plant of *Allium cernuum* for herbaceous grounds. (Given by Dr. H. H. Rusby.)

9 cactuses from Colorado for herbaceous grounds. (Given by Dr. C. E. Bessey.)

8 cactuses from Mexico for conservatories. (By exchange with United States National Museum, through Dr. J. N. Rose.)

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Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

Vol. 25, part 1, issued August 24, 1907. Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908, contains descriptions of the family Grossulariaceae by F. V. Coville and N. L. Britton, the Platanaceae by H. A. Gleason, the Crossosomataceae by J. K. Small, the Connaraceae by N. L. Britton, the Calycanthaceae by C. L. Pollard, and the Rosaceae (pars) by P. A. Rydberg.

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WILLIAM ALPHONSO MURRILL

Assistant Director

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JOHN R. BRINLEY, *Landscape Engineer.*
WALTER S. GROESBECK, *Clerk and Accountant.*
DR. JOHN A. SHAFER, *Museum Custodian.*
PERCY WILSON, *Administrative Assistant.*
NORMAN TAYLOR, *Custodian of the Plantations.*

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FURTHER EXPLORATION IN JAMAICA.

TO THE SCIENTIFIC DIRECTORS,

Gentlemen: — In accordance with previous authorization and with the approval of the president of the Board of Managers of the Garden, I have continued the botanical exploration of the island of Jamaica and the collecting of plants and specimens for the greenhouses, museums and herbarium during a period of about four weeks, being absent from the Garden for the purpose from August 22 to September 30, 1908, this being my fourth trip to Jamaica.* I was accompanied by Mrs. Britton, who materially supplemented our collections of cryptogamic plants during the trip, besides giving much aid in the preservation and preparation of the general collection made, and she remained on the island for two weeks subsequent to my return for the purpose of visiting portions of the interior mountain region in search of plants not yet secured. Sailing from New York August 22 on the Royal Mail Steam Packet "Tagus," we arrived at Kingston without incident on August 27. Proceeding at once to Hope Gardens, consultation was had with the Hon. H. H. Cousins, Director of Agriculture of the Jamaica Government, and with Mr. Wm. Harris, Superintendent of Public Gardens, and a scheme of exploration was determined upon, planned to enable us to visit portions of the island which we had not seen during our three previous trips. To our great satisfaction it had already

* See Journal New York Botanical Garden 7: 245; 8: 229; 9: 81.

been arranged that Mr. Harris would accompany us during most of the time. I had begun, during the past summer, in coöperation with Mr. Harris through correspondence, the preparation of a Flora of Jamaica, and brought with me a copy of the manuscript for almost one third of this work; considerable time was given to the consideration of this study, with reference to the valuable herbarium and collection of living plants at Hope Gardens. Knowledge of the Jamaica flora has been much increased during recent years through the collecting work of Mr. Harris and the study of specimens thus obtained by Professor Ignatius Urban, of the Berlin Botanical Garden, and others, while the expeditions sent on behalf of the New York Botanical Garden have also contributed materially. Very much more is therefore known about this flora than in 1893, when the Hon. Wm. Fawcett, late Director of Public Gardens and Plantations, published his "Provisional List of Jamaica Flowering Plants." We now propose to bring this knowledge into available form for general use by the publication of the work above mentioned, as a volume of "Memoirs of the New York Botanical Garden."

Some collecting was accomplished in the vicinity of Kingston and near Constant Spring, from August 28 to 30, but Spanish Town was made the first important base of operations, from August 30 to September 3, principally as the most convenient point for visits to the Healthshire Hills, a low and rocky range of considerable extent situated near the southern coast; we traversed them on foot in two directions, progress being slow and difficult on account of the extremely high temperature and great aridity, but were well rewarded by the discovery of several interesting shrubs and small trees.

A day was given to the study of the hills north of Spanish Town and the valley of the Rio Cobre below Bog Walk in search of the rare shrub *Bumelia Purdiei*, named in honor of William Purdie, a botanical collector who spent the years 1843–44 in Jamaica in the interests of the Royal Gardens at Kew, England; we failed to find it, but detected several other plants of interest.

Proceeding to Mandeville on September 3, four days were

devoted to collecting in the Parish of Manchester, mostly at altitudes of 1,500 to 2,500 feet. The climate of this region is one of the most delightful in the West Indies, neither too warm nor too cold, too wet nor too dry. One of my objects in visiting this part of Jamaica was to secure living plants and herbarium specimens of two species of air-plants, bromeliads of the genus *Hohenbergia* growing mostly on the limbs of trees, found there some years ago by Mr. Harris and at that time new to science. I was desirous of increasing our collections of these remarkable plants, which have long narrow leaves growing in tufts, in appearance being something like a gigantic bird's-nest, the flowers borne in large clustered spikes on a long stalk arising from the middle of the tuft. Many kinds of these bromeliads grow in Jamaica and a considerable number are endemic there. We readily found the plants desired, as well as a third species; some fifteen different *Hohenbergias* are now known from Jamaica and we have specimens of all of them; at least six are new to science and will soon be technically described. Special attention was given during the entire trip to plants of this group, the Pineapple Family (Bromeliaceae), and in addition to the *Hohenbergias* most of the numerous species of the other large genera, *Tillandsia*, *Guzmania* and *Catopsis* were secured and one species each of *Bromelia*, *Aechmaea* and *Pitcairnia*. All these air-plants are known in Jamaica as "wild pines," the cultivated pineapple being called "pine"; inasmuch as there are no pine trees on the island, except some planted ones high up in the mountains, no serious confusion results in the application of the English name, which could not be used for these plants in the north temperate zone. The Garden's public collection of bromeliads is in conservatory house No. 2 and is a fairly representative exhibit, now to be materially augmented by plants obtained in Jamaica; many others grow in Cuba, Santo Domingo and in other parts of tropical America which I hope may be obtained by subsequent exploration.

Our collections in Manchester were extensive, including specimens of many characteristic trees and shrubs, among them the large-leaved little-known Plumier's grape-tree (*Coccolobis Plumieri*), found in ripe fruiting stage on a hillside at Mandeville; it

is a relative of the sea grape or sea grape-tree (*Coccolobis uvifera*) a common tree of tropical American sea-coasts, extending northward to Florida and Bermuda, and like it has large clusters of edible fruits something like small plums, the branches resembling bunches of grapes.

During the years 1847 to 1849 the Moravian minister Henry R. Wullschlaegel was stationed in Jamaica; he was an enthusiastic botanical collector and discovered many plants new to science, some of which have not been found again, and are represented in collections only in Europe; much of his work, both pastoral and botanical, was done in Manchester; Fairfield was one of his stations, and there we went in search of some of the varieties discovered by him; we were hospitably received by Bishop A. Westphal who gave us information about the district, which has been almost completely cleared of natural woodland since the time of Wullschlaegel; a few small tracts of "bush land" still exist, but an examination of them did not reveal any of the desiderata at this point though some were subsequently found elsewhere. We were especially desirous of obtaining the little leafless ground orchid, named in his honor *Wullschlaegelia*, but our search was fruitless, and this still remains one of the rarest of Jamaican plants; most of the other orchids of the island, enumerating, large and small, some 180 species, are now represented in our collections, several additions having been made during this expedition; in the study of these plants I am grateful to Mr. Oakes Ames of North Easton, Massachusetts, for aid and information; he recently presented his valuable collection of living orchids to the Garden,* and this is of great assistance in our studies; I secured a number of duplicate specimens of orchids for his herbarium.

We returned to Kingston on September 7 and on September 9 made a new start by carriage to the mountains, our objective point being Cedar Hurst in the Parish of Portland, the road crossing the range at Hardware Gap at an altitude a little over 4,000 feet, and descending to Cedar Hurst at about 2,000 feet, the distance being about 32 miles; beautiful mountain scenery is had at

* See Journal New York Botanical Garden 8: 250. 1907.

the higher elevations and the drive to Hardware Gap and return to Kingston is one of the most interesting and enjoyable in the West Indies. I had traversed it in the spring of this year * and was glad of the opportunity to see the same vegetation in the autumn; we collected specimens of a number of species not found in the spring, including the endemic air-plant *Guzmania Fawcettii*, named in honor of the Hon. William Fawcett, late Director of Public Gardens and Plantations of Jamaica, and found first by Mr. Harris near Hardware Gap; it proved to be quite abundant in the vicinity. At Hardware Gap, as elsewhere in these mountains, a number of north temperate zone herbaceous plants are naturalized along the roadsides, including wild strawberries, buttercups, sorrel and dock, these existing there owing to the cool climate to which they are accustomed at home. Just beyond Hardware Gap five kinds of tree ferns grow plentifully near the road.

From Cedar Hurst we climbed up to Moody's Gap, at about 3,000 feet elevation. One of the most interesting plants found was the climbing aroid, *Philodendron tripartitum*, growing on banks and trees, its three-parted leaves somewhat resembling those of jack-in-the-pulpit of our own woodlands, a plant of the same family. I was glad to obtain this species for the collection of climbing aroids in conservatory house No. 4. Another conspicuous air-plant growing here is *Guzmania capituligera*, its large inflorescence bearing numerous small clusters of flowers. Many orchids were obtained and the region is rich in rare and interesting ferns and mosses, many species of which were collected. Two species of wild *Begonias* were abundant and beautiful; the flora of this region is very rich and diversified and more specimens were collected on this day than on any other of the trip; the rainfall here is high, but we were favored by perfect weather.

Returning again to Constant Spring Hotel on September 11, some time was given to the care of the collections and to further studies at Hope Gardens. On September 13 a visit was made to the Red Hills near Constant Spring, but the next important base of work was Bath, near the eastern end of the island, in the Parish

* See Journal New York Botanical Garden 9: 81. 1908.

of St. Thomas, which we reached by carriage on September 14, driving forty-four miles from Kingston ; the excellent road runs along and near the southern coast ; some collecting was accomplished at points on the way, but the long drive took most of the daylight.

Bath is situated in the valley of the Plantain Garden River, at an altitude somewhat above 100 feet and the climate is hot and wet. The hot sulphur springs, which gave the town its name, are in a lateral valley about a mile north of the town, and the baths there have long been esteemed. Bath is also noteworthy as the site of an old botanical garden where many valuable plants were first introduced into Jamaica, and which still contains many interesting exotic trees of large size. While here we were joined by the Hon. H. H. Cousins, Director of Agriculture, who came to inspect the old garden and to consider the availability of part of it as a nursery for cacao, the chocolate tree (*Theobroma cacao*), the cultivation of which is of increasing importance in the warm moist parts of Jamaica.

Our first collecting trip from Bath was to the Cuna Cuna Gap, through which passes the riding road over the mountains from Bath to Port Antonio ; the gap is six and one half miles from Bath, at an elevation shown by the aneroid barometer to be about 2,400 feet ; we traversed this road on foot and proceeded some two miles beyond the pass down the northern slope of the mountains, returning to Bath long after dark, favored by perfect weather until nightfall, when the rain caught us several miles out on the rough road and although protected by rubber coats we reached our lodgings in a somewhat bedraggled condition. But the experience of the day was well worth the wetting ; the mountain views were beautiful, the temperature at the higher elevations delightful and the flora greatly diversified, containing many elements not familiar to us and we loaded a horse with interesting plants and specimens, including several rare species of the elegant shrubs and small trees of the Meadow Beauty Family (Melastomaceae), represented by many species in Jamaica. Mr. Harris detected a single plant of an orchid with a strikingly beautiful orange-colored flower growing on a tree trunk ; it is

quite unknown to us and must be very rare; the most diligent search of tree-trunks and rocks failed to reveal another of the same kind; the plant was preserved in formalin for Mr. Ames' examination.

One object in visiting Bath was to see the rare tree *Prioria copaifera*, definitely known to us to grow only in the vicinity of that place, although reported to occur also in Panama; it is locally known as oil-tree and gum-tree, its wood containing an inflammable heavy oil or liquid resin, which gives off dense black smoke when burned; it was discovered here before 1860 by Nathaniel Wison, for many years curator of the Bath Botanical Garden and a diligent collector who contributed much to the knowledge of Jamaica plants; its generic name commemorates the important botanical work of Dr. R. C. Alexander Prior in Jamaica. We failed to find it on the Cuna Cuna road. Mr. Harris had visited the district in search of this tree some years ago, and had found one at Mansfield, a short distance from the town. We therefore visited the estate, where we were cordially received by the owner, Mr. A. H. Groves, who kindly gave us permission to explore his woodlands. We made collections of many plants, including some fine orchids, but did not find the tree sought for. The valley of the Devil's River on this estate proved very interesting, but we were driven out by rain in the afternoon and could not explore it thoroughly.

The next day we again set out to find *Prioria*, going to Bachelor's Hall estate where it was first discovered by Wilson. After climbing over the foothills of the John Crow Mountain range all day, with only ordinary success, we were finally rewarded at dusk and again in the rain, by finding it in a valley at an altitude of about 600 feet. The tree is a magnificent one, forming a straight smooth cylindric trunk rising to at least 90 feet, the head of dark green foliage being oblong in outline. It was not in flower at the time, but we obtained specimens of the foliage from a young specimen and plenty of fruits and young seedlings on the ground under a large tree. The genus is of the Senna Family and has remarkable fruits, these being woody one-seeded, somewhat heart-shaped pods, about three inches across, the seed germinating in-

side the pod, which does not spilt open. Our walk this day indicated one apparently practicable way of reaching the top of the John Crow Mountain range, which has never been visited by botanists.* We reached, at one time, an elevation in the hills of some 1,300 feet, and had a close view of part of the main range; our guides pointed out a course which might be taken to reach the summit during dry weather, probably requiring camping only for two nights. It is probable that unknown plants exist at the higher elevations of this range, which runs nearly at right angles to the main mountain chain, and I hope that opportunity may come to explore these mountains before our study of the Jamaica flora is completed.

The last day at Bath was occupied by care of the collections, studies of the trees in the old botanical garden, a visit to the ravine above the baths and in attending an interesting meeting of the local branch of the Jamaica Agricultural Society, held to give the members an opportunity of meeting Mr. Cousins, Director of Agriculture. We drove back to Kingston on September 19, traversing the "inland road," which took us through some interesting hilly country where specimens of several species not seen by us before were collected. Near Serge Island we found the Jamaica wild grape-vine (*Vitis caribaea*) in full fruit, the vine climbing to the top of a tall tree, the small grapes of a rather pleasant flavor; we came out on the main coastal road at Belvidere and reached Constant Spring Hotel late in the evening.

Mr. Harris and I devoted September 21 to 23 to another trip to the Parish of Manchester, the base being the hotel at Bloomfield, very near Mandeville, and extensive collections were made in the country north and northwest of that town, driving one day well north of the railway to Grove Hill. We again failed to see the elusive little orchid *Wullschlaegelia*, but found some of the other interesting plants collected by Wullschlaegel. The best thing discovered is a species of *Dorstenia* detected by Mr. Harris growing on vertical limestone cliffs at Somerset. This peculiar genus of small herbaceous plants has leaves in tufts, and among them

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*See Journal New York Botanical Garden 7: 245. 1906.

the cluster of very small flowers borne on a nearly flat receptacle. It is included by botanists in the Mulberry Family on account of the technical characters of its flowers, but should, I think, be classified as a distinct natural family. The species found here has shield-shaped leaves and is new to the Jamaica flora, if not new to science; the other known Jamaica species, *Dorstenia cordifolia*, has heart-shaped leaves. Near Kendal I had the pleasure of seeing for the first time in bloom, the orchid *Epidendrum discoidale*, a stout large species with characteristic brownish flowers, and secured plants for growing.

We returned from Mandeville on September 24, driving through the parishes of Manchester and Clarendon some twenty miles to the railroad station at Four Paths. Between Clarendon Park and Four Paths we crossed some characteristic savanna lands at an elevation not over 200 feet above the sea; these are grassy plains interspersed with thickets, and an occasional pond, very dry at this time, but subject to flooding after heavy rains. Here we obtained specimens of several rare shrubs and herbaceous plants not previously seen by us, including the beautiful shining-leaved little tree *Mouriria*, of the Meadow Beauty Family. Next day the collections made during the whole trip were packed at Hope Gardens where they had accumulated. I am grateful to Mr. Cousins and Mr. Harris for aid in packing and shipping. Two general collections of ferns from various parts of the world contained in the herbarium at Hope Gardens but not needed there, were transferred by them to the New York Botanical Garden and formed part of the shipment. I had selected from our greenhouses before leaving New York, a large boxful of duplicate living plants for the Jamaica Department of Agriculture, and a number of duplicate herbarium specimens, the receipt of these ferns being thus in the nature of an exchange.

I sailed from Kingston on the "Atrato" September 26 and arrived in New York September 30, the collections coming on the same ship, except some of those made by Mrs. Britton. Living plants, seeds, fruits and herbarium specimens obtained during the expedition aggregate about 3,500 specimens and are important additions to our representation of the West Indian

flora. The duplicates obtained will be used in exchange with other institutions. The expenses were defrayed by a generous contribution from Mr. D. O. Mills, president of the Board of Managers of the Garden.

Respectfully submitted,

N. L. BRITTON,
Director-in-Chief.

THE MUSEUM COLLECTIONS OF FLOWERING PLANTS.

The flowering plants of the museum collections fall into two distinct divisions, the public exhibit and the herbarium. The public exhibit is installed in the east hall and the east wing on the second floor of the museum building, except a block and a half of cases now standing in the west hall, while the herbarium is arranged in the main herbarium room situated on the top floor of the building.

Two distinct sections constitute the public exhibit: first, the Local Flora, a collection of specimens representing the plants growing without cultivation within a radius of one hundred miles of New York City, is displayed in the swinging frames borne on standards placed between the large exhibition cases. Each stand displays at least ninety-six representatives from the area concerned. The specimens are each provided with a label giving the common name, the plant name, the habitat, and the distribution of the species. Most of the species occurring within the one hundred mile radius referred to are now installed and labelled.

In the second section of the public exhibit, called the Synoptic Collection, the flowering plants are arranged on a system showing their relationship by families, beginning with the more simply organized groups and ending with the more highly organized. Characteristic specimens represent each plant family. The specimens are supplemented by plates or drawings which stand beside each specimen at the back of the case, while on the shelves in front of the plates and specimens are shown objects, mainly parts of plants from related species or genera, such as bark, leaves, flowers, fruits, woods and fossil remains.

The collection of flowerless plants was described in the June number of the JOURNAL for 1901. As compared with the four subkingdoms of the flowerless plants, the flowering plants comprise a single subkingdom, technically called the Spermatophyta, or the seed-bearing plants. However, this single subkingdom divides into two sharply defined groups, namely, the cone-bearing plants, or Gymnosperms, represented by the conifers, or the shrubs and trees commonly called evergreens, and the fruit-bearing plants, or the Angiosperms, represented by the herbaceous vegetation and the deciduous-leaved shrubs and trees.

Like their relatives, the higher group of flowerless plants, the cone-bearing plants in an early geological age were the more prominent seed-bearing representatives of the vegetable kingdom, but in a later age, as in the present one, the cone-bearing plants apparently began to decrease and the fruit-bearing plants came to predominate; consequently the present representatives of the cone-bearing plants may be considered a remnant of a once dominant group in the plant kingdom.

The herbarium was described in the March number of this JOURNAL for 1900. At the time that description appeared all the herbarium specimens at the Garden, of both the flowerless and flowering plants, were arranged in the main herbarium room referred to in a former paragraph. Now a half dozen other rooms on the top floor of the Museum Building are devoted in whole or in part to the flowerless plants, while the flowering plants alone occupy the cases in the main herbarium room. The growth of the herbarium has resulted in about an equal division of the two main groups of plants as far as the case room they occupy is concerned, the flowerless and the flowering plants each occupying cases with a total of over five thousand pigeon holes, while fruits and seeds and other objects too bulky to be placed on herbarium sheets are contained in cabinets at the southern end of the herbarium room.

The herbarium of flowering plants is made up of the herbarium of Columbia University, including the Torrey Herbarium, the Meissner Herbarium, and the Chapman Herbarium, together with miscellaneous sets of specimens, and the Garden

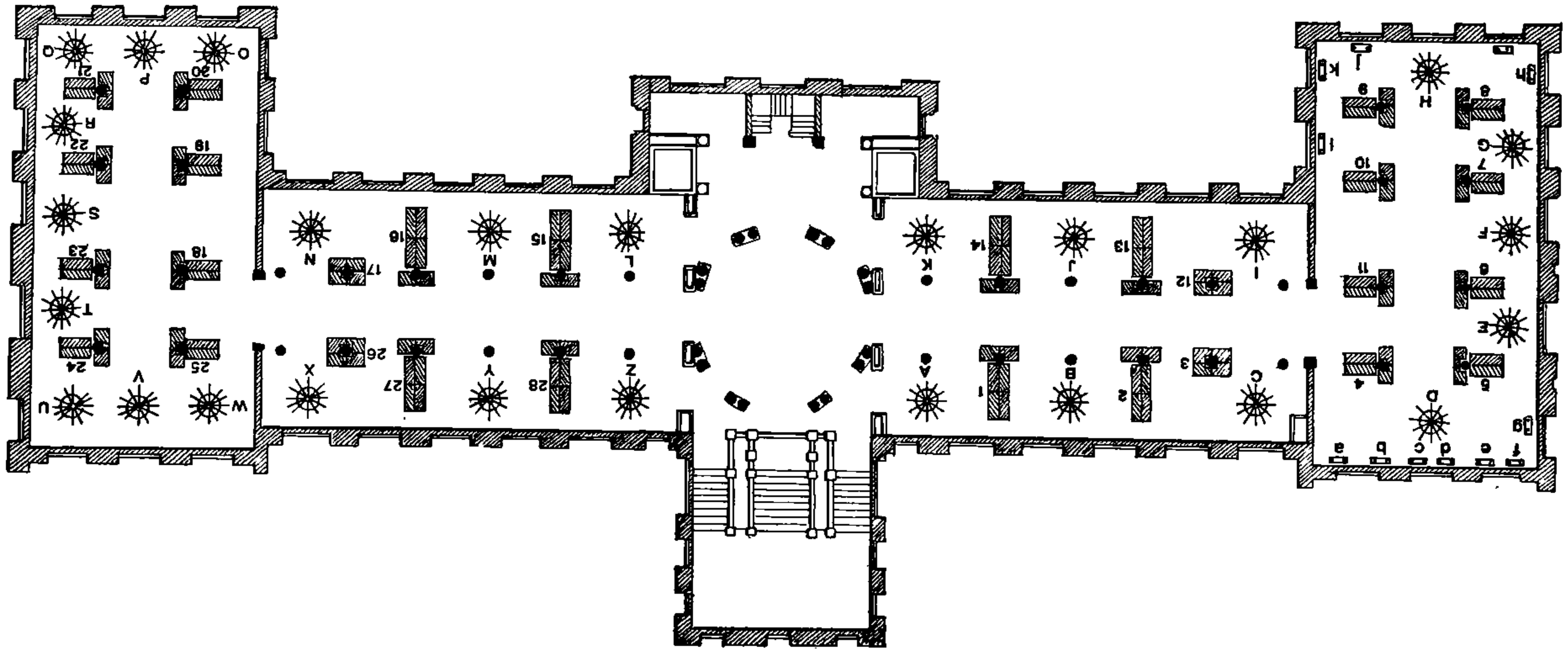

FIG. 29. Floor-plan of the museum of systematic botany. The flowering plants of the Local Flora are displayed in stands *L–Z*; the Synoptic Collection occupies blocks *14–28*.

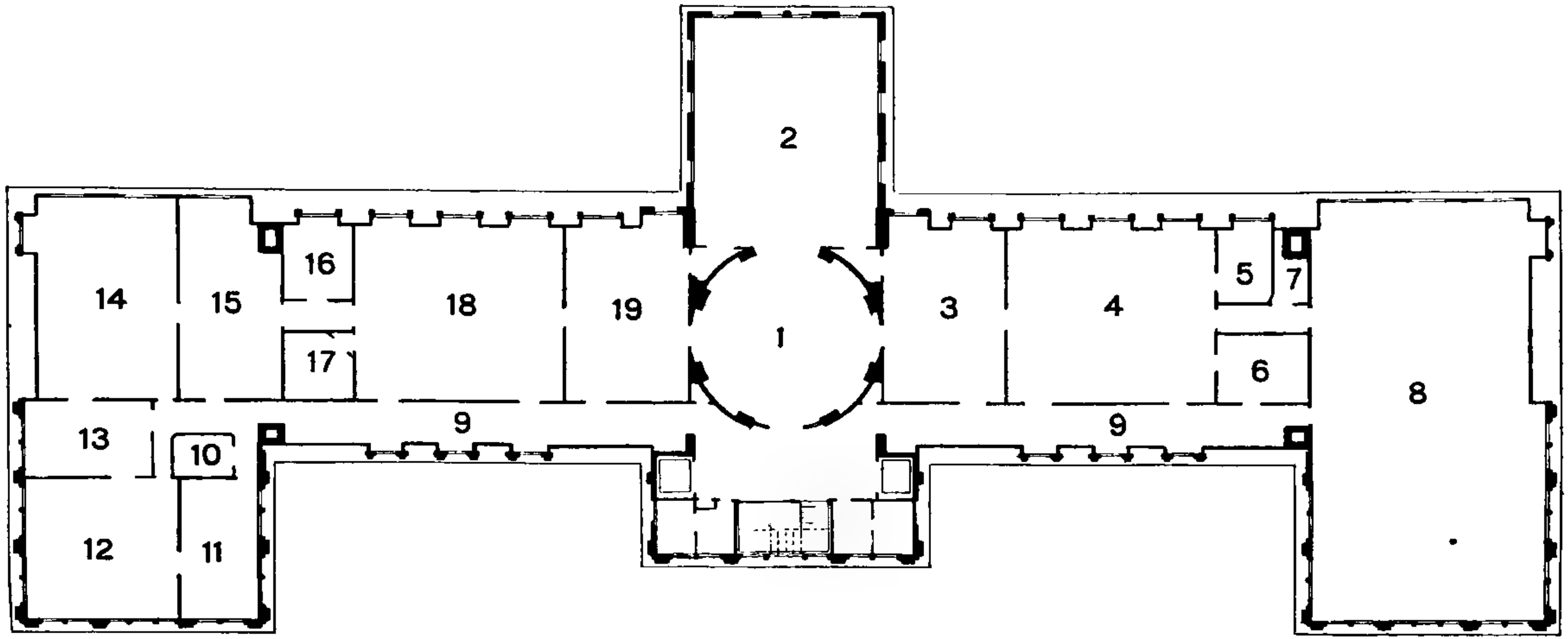

FIG. 30. Plan of upper floor of museum building. 4. Herbarium of Ferns. 6. Herbarium of Mosses. 8. Herbarium of Flowering Plants. 14. Herbarium of Fungi. 18. Herbarium of Seaweeds and Liverworts.

Herbarium, including over twenty-five individually formed herbaria of considerable size, and several smaller herbaria, and miscellaneous sets of plants. The collection is especially rich in specimens from all parts of the North American mainland, the West Indies, South America, Europe, China, the Philippines, and Australia, together with a fair representation of the vegetation of other parts of the world.

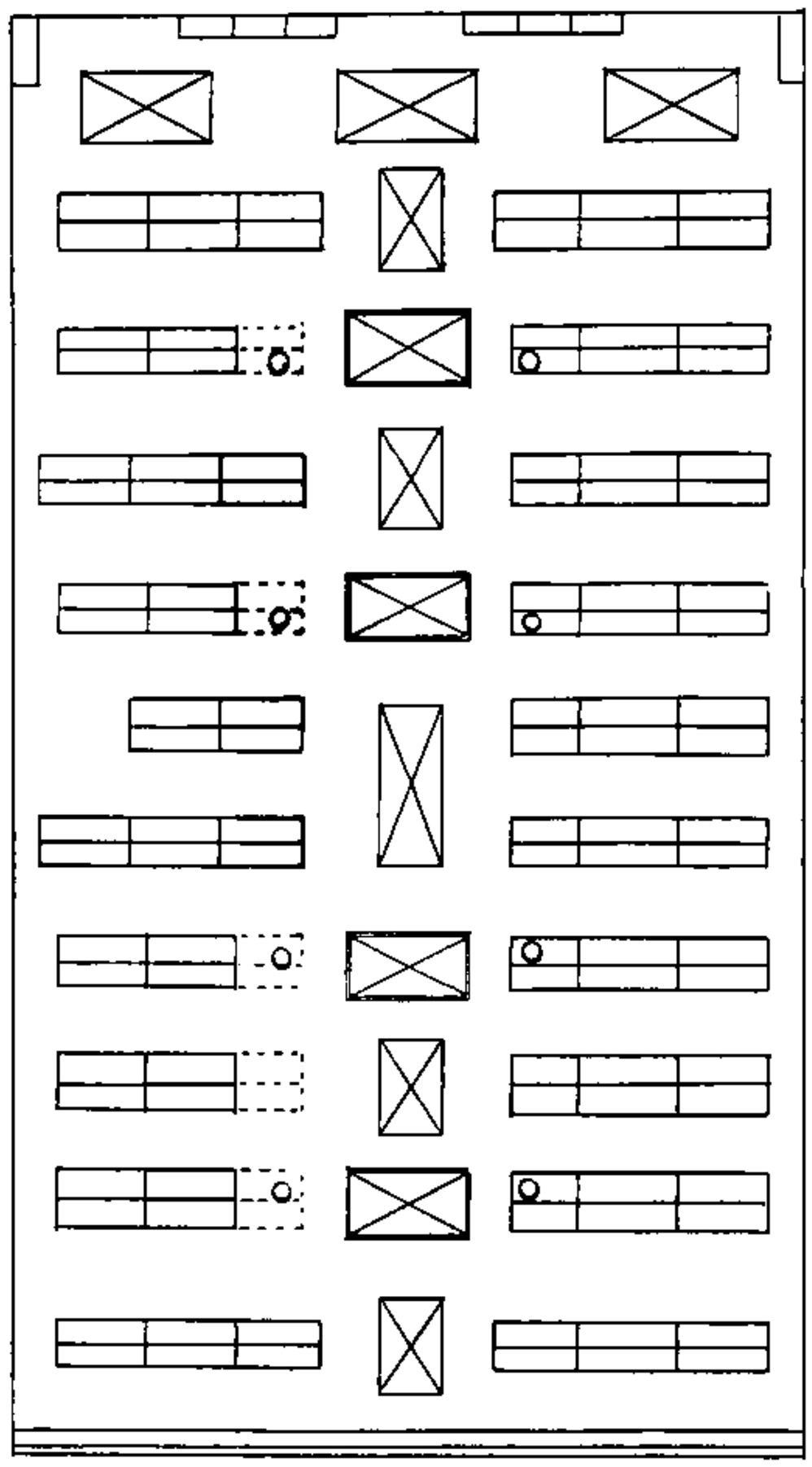

FIG. 31. Floor-plan of the herbarium of flowering plants. Compare Fig. 7 in the JOURNAL for March, 1900. Dotted lines represent cases not yet installed, See frontispiece for style of cases, cabinets and tables.

The importance of the Columbia herbarium, in addition to the specific elements referred to above, lies largely in the great bulk and variety of material brought together and preserved by Dr. Torrey while he maintained the center of botanical activity in North America. That period was conspicuously productive both of individuals interested in botany and of lasting botanical

achievement. During the first half of the nineteenth century, the limited but well-settled area of the United States was apparently more evenly furnished with men interested in plants and their distribution than at any period before or since. Professional men, business men and army officers in all parts of eastern North America sent their specimens to Dr. Torrey; while the collections made on many of the expeditions sent to explore the yet unknown portion of the West came to him for study. Dr. Torrey's successors lost no opportunity to increase the value and usefulness of the original foundation and accumulated much important material by means of exploration, exchange and purchase.

The Garden and the Columbia herbaria supplement each other as well as any two separately formed collections could. The consolidation of the herbaria cited in the following list may be considered the foundation of the Garden herbarium:

The J. J. Crooke herbarium — North American mainland, West Indies and Pacific Ocean regions.

The F. M. Hexamer herbarium — North American mainland and Europe.

The H. E. Hasse herbarium — Central and western United States, Mexico and Greenland.

The P. A. Rydberg herbarium — Western United States and Sweden.

The L. R. Gibbes herbarium — Southeastern United States.

The P. V. LeRoy herbarium — North American mainland, West Indies and Europe.

The H. Edwards herbarium — North American mainland, chiefly California, and Australia.

The A. M. Vail herbarium — Eastern United States.

The F. E. Lloyd herbarium — Pacific slope and eastern North America.

The O. R. Willis herbarium — Eastern United States.

The F. S. Earle herbarium — North American mainland, especially the south and the west.

The W. A. Murrill herbarium — Eastern United States.

The E. G. Britton herbarium — Eastern North America.

The L. T. Chamberlain herbarium — North American mainland, especially California and the northeastern United States.

The E. C. Howe herbarium — Eastern United States.

The A. Vigener herbarium — Mexico and Europe.

The A. Henry herbarium — China.

The O. Kuntze herbarium — West Indies, Central and South America and Old World.

The American Museum of Natural History herbarium — United States, Central America and Old World.

The Torrey Botanical Club herbarium — Region within one hundred miles of New York City.

Some specimens of flowering plants were also contained in the following herbaria which constitute a large portion of the collections of flowerless plants :

The J. B. Ellis herbarium.

The C. L. Anderson herbarium.

The N. Pike herbarium.

The J. S. Billings herbarium.

The L. M. Underwood herbarium.

The G. S. Jenman herbarium.

The T. F. Allen herbarium.

The W. Mitten herbarium.

The G. Massee herbarium.

These, with two other large elements, constitute the Garden herbarium at present. First, many sets of plants from portions of North America, South America and the Old World which were imperfectly known or could not be explored during the period of greater botanical activity at Columbia. Second, the material secured by collectors on journeys of exploration maintained by the Garden on the American mainland, the West Indies and the Philippine Islands.

J. K. SMALL,
Head Curator.

DR. GAGER'S NEW POSITION.

At the meeting of the scientific directors of the Garden, held June 13, 1908, the following letter was received from Dr. C. Stuart Gager, Director of the Laboratories:

5 June, 1908.

DR. N. L. BRITTON,
Director-in-Chief, New York Botanical Garden.

Dear Sir: On the 30 of May I received notice of my appointment as Professor of Botany in the University of Missouri.

A realization of the unusual opportunities of my present position, and a full appreciation of the congenial circumstances and harmony that have marked my official relations here, have not made it easy for me to decide to accept this new appointment.

For several reasons, however, I feel that I ought not to decline. I have forwarded my acceptance to the executive committee of the university, and beg to present herewith my resignation as director of the laboratories of the New York Botanical Garden, to take effect on August 31, 1908.

It will be difficult to terminate by that time some investigations now in progress, and I will esteem it a great favor if I may have the privileges of the laboratories and the experimental garden until this work can be brought to a close during the coming autumn.

Very sincerely yours,
(*signed*) C. STUART GAGER,
Director of the Laboratories.

This resignation of Dr. Gager was received with regret, and his valuable services to the Garden and to botanical science were discussed. The resignation was accepted and the chairman was requested to write Dr. Gager a letter expressing the appreciation of the scientific directors of his services while occupying the position of director of the laboratories.

A copy of the letter written by the chairman of the scientific directors is as follows:

July 6, 1908.

DR. C. STUART GAGER,

Director of the Laboratories.

Dear Dr. Gager: The board of scientific directors, in accepting your resignation, have instructed me to express their great regret at the necessity for doing so, and to write to you a letter expressing their appreciation of your services while occupying this position.

In carrying out these instructions, it gives me pleasure to say that your services both as an instructor of those who have studied under you and as an original investigator have been, without exception, highly satisfactory.

Your personal qualities have endeared you to all the members of the garden staff who have been brought into close relations with you, and you will carry with you our high personal esteem, as well as our official approval. Not the least among our feelings of regret is that in connection with the loss that the scientific interests of this city and locality will suffer through your removal. At the same time, we heartily congratulate Missouri upon its good fortune, and trust that you will continue to feel bound to us by mutual interest in your work and by the ties of good fellowship.

Sincerely yours,

(*signed*) H. H. RUSBY,

Chairman.

Dr. Gager was appointed director of the laboratories of the Garden in 1906 and commenced work in that capacity in February of that year. While occupying the position he has directed the work of many students and has carried on noteworthy investigations in plant physiology and plant cytology. His principal literary production during this period is his account of his extended experiments with radium on the growth of plants, which is now being printed as the third volume of Memoirs of the Garden.

THE NEWLY APPOINTED DIRECTOR OF THE LABORATORIES.

In filling the position of director of the laboratories, made vacant by the resignation of Dr. Gager to accept the professorship of botany in the University of Missouri, the scientific directors, at their meeting on June 13, considered the subject in all its bearings and concluded that it would be most desirable for much of the Garden's work to secure a plant pathologist; Professor Fred J. Seaver, of the North Dakota Agricultural College, was invited to accept the post, which he subsequently did, and reported for duty early in September. Mr. Seaver graduated from Morningside College in 1902, and subsequently studied as a university scholar in botany at the State University of Iowa, and served as a special assistant to Dr. J. C. Arthur at Purdue University. He held a fellowship in botany at the State University of Iowa during 1903 and 1904, where he received the degree of master of science; he held a Columbia University fellowship in botany in 1906 and 1907, and carried on investigations at the New York Botanical Garden during that period. He was a botanical assistant at the University of Iowa in 1904 and 1905, instructor in biology in Iowa Wesleyan University, 1905–1906, and has recently been assistant professor of botany in the North Dakota Agricultural College. Mr. Seaver's original investigations have been upon certain groups of minute fungi parasitic on living plants and this knowledge will be of great advantage to us in the cultural work of the Garden. Mr. Seaver will also prepare some of the monographs of groups of fungi for "North American Flora," in addition to his regular work of supervising the work of students.

NOTES, NEWS AND COMMENT.

The autumn course of lectures to the 4 B and 5 B grades of the public schools of the Bronx, comprising fifteen lectures with accompanying demonstrations, began October 6 and will be concluded in November. The total attendance of pupils and teachers at these exercises will reach twelve thousand.

The entire collection of Boletaceae in the herbarium of Cornell University has recently been sent to the Garden for critical examination. This collection contains valuable material from Alabama, North Carolina, the Adirondacks, the Cayuga Lake Basin, Nova Scotia, Ohio, Michigan, and elsewhere, mostly collected by Professor Atkinson or his associates. A number of duplicate specimens have been presented to the Garden.

Gray's New Manual of Botany has recently appeared in its seventh edition, prepared by Professors B. L. Robinson and M. L. Fernald of Harvard University, with the collaboration of other specialists.

A field meeting of the members of the Department of Botany of the Brooklyn Institute of Arts and Sciences was held at the Garden on the afternoon of Saturday, October 3, over forty ladies and gentlemen being in attendance. They were received by Dr. Britton, who spent the afternoon with them, describing the collection of shrubs (fruticetum), and they were subsequently escorted through other parts of the grounds and the public conservatories by Mr. Wilson.

Meteorology for September. — Total precipitation recorded for September 1.42 inches. Maximum temperatures were recorded of 84° on the 2d, 85° on the 9th and 11th, 86° on the 19th and 81° on the 25th; also minimum temperatures of 46.5° on the 4th, 49° on the 8th, 46.5° on the 16th, 56.5° on the 22d and 41° on the 29th. The mean temperature for the month was 63.5°.

ACCESSIONS.

LIBRARY ACCESSIONS FROM SEPTEMBER 1 TO SEPTEMBER 30, 1908.

EULER, HANS. *Grundlagen und Ergebnisse der Pflanzenchemie.* Erster Teil. Braunschweig, 1908.

FISCHER, JULIUS. *Die Lebensvorgänge in Pflanzen und Tieren.* Berlin, 1908.

FRANCÉ, RAOUL H. *Die Lichtsinnesorgane der Algen.* Stuttgart, 1908.

HALLIER, HANS. *Über Juliania, eine Terebinthaceen-Gattung mit Cupula. . . .* Dresden, 1908.

HOUARD, CLODOMIR. *Les zoocécidies des plantes d'Europe et du bassin de la Mediterranée. . . .* Tome Premier. Paris, 1908.

KLINICKSIECK, PAUL & VALETTE, TH. *Code des couleurs. . . .* Paris, 1908.

MIGULA, WALTHER. *Pflanzenbiologie.* Leipzig, 1909 (1908).

VICKERS, ANNA. *Phycologia Barbadensis.* Paris, 1908.

MUSEUMS AND HERBARIUM.

175 specimens of fungi from New York City. (Collected by Dr. W. A. Murrill.)

133 specimens of fungi from New Orleans, Louisiana. (Given by Mr. F. S. Earle.)

106 specimens of flowering plants from Africa. (By exchange with the Royal Gardens, Kew, England.)

100 specimens "Kryptogamae Exsiccatae," Cent. XIV, for the Columbia Herbarium. (By exchange with the Natural History Museum, Vienna, Austria.)

2 specimens of Rutaceae from Lower California. (Given by Mr. T. S. Brandegee.)

34 specimens of hepatics from Mexico, Panama and Colombia. (Distributed by Mr. F. Renauld.)

PLANTS AND SEEDS.

78 plants for conservatories. (By exchange with United States National Museum, through Dr. J. N. Rose.)

2 ferns for herbaceous collection. (Given by Mr. R. C. Benedict.)

3 plants of *Fragaria* for herbaceous collection. (Collected by Dr. P. A. Rydberg.)

30 plants for the herbaceous collections. (Collected in the vicinity.)

1 plant of *Epidendrum* for conservatories. (Given by Mr. D. T. Darnolt.)

1 plant of *Haemanthus* for conservatories. (Given by Mrs. W. H. Harrison.)

7 palms for conservatories. (Given by Mrs. P. L. vonHemert.)

16 plants from Mexico for conservatories. (Given by Dr. F. E. Lloyd.)

2 plants for conservatories. (Given by Mr. F. F. vonWilmowsky.)

2 packets of *Crataegus* seed. (Given by Mr. B. F. Bush.)

1 packet of *Thalictrum* seed for herbaceous collection. (Given by Mr. E. S. Steele.)

1 packet of seed from Mexico. (Given by Dr. H. H. Rusby.)

24 plants derived from seed from various sources.

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Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

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Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908, contains descriptions of the family Grossulariaceae by F. V. Coville and N. L. Britton, the Platanaceae by H. A. Gleason, the Crossosomataceae by J. K. Small, the Connaraceae by N. L. Britton, the Calycanthaceae by C. L. Pollard, and the Rosaceae (pars) by P. A. Rydberg.

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BRONX PARK, NEW YORK CITY

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JOURNAL

OF

The New York Botanical Garden

EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

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JOURNAL

OF

The New York Botanical Garden

VOL. IX. November, 1908. No. 107.

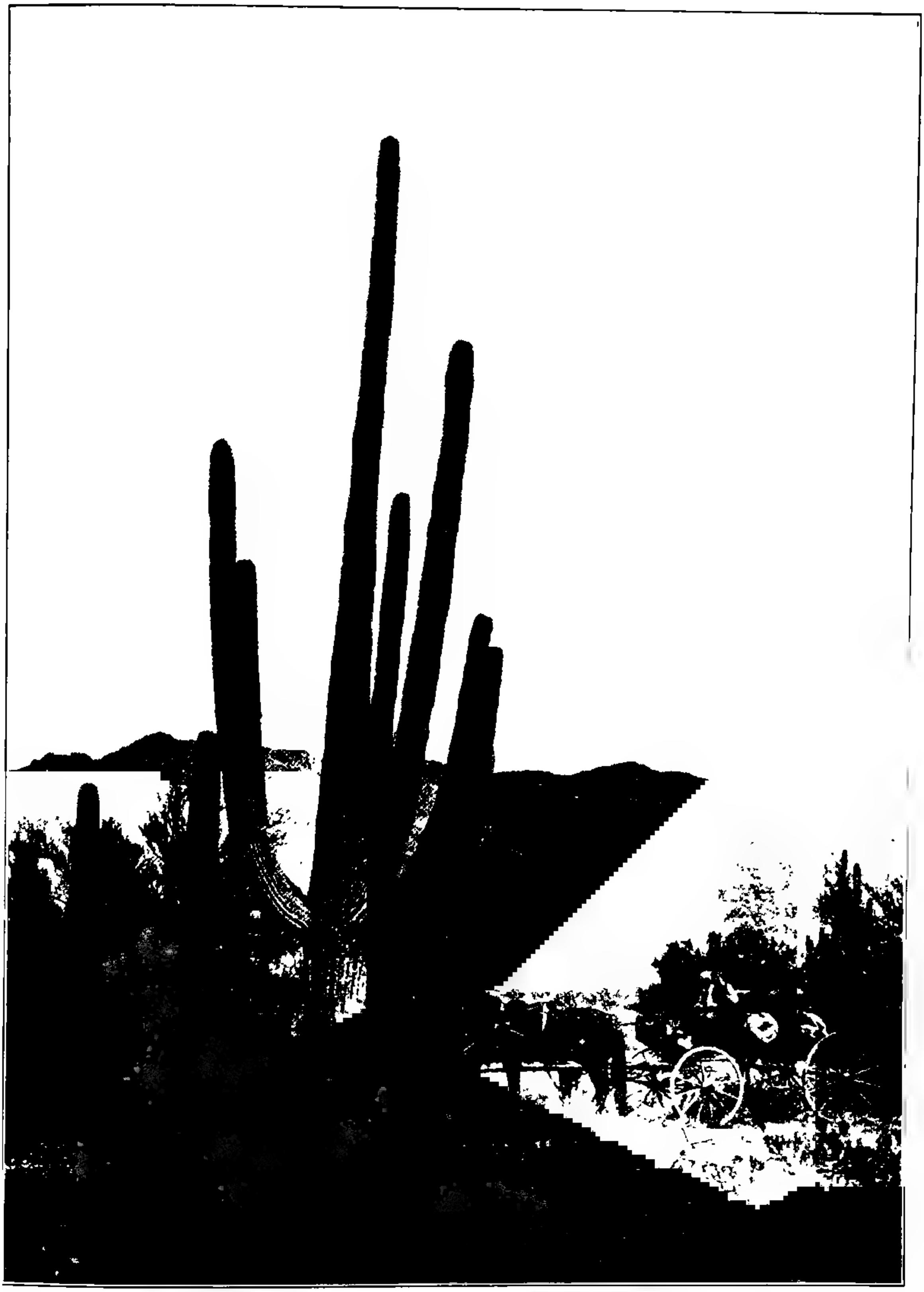
A NEW GENUS OF CACTACEAE.

The gigantic cactus of Arizona and adjacent regions, known in its home by the common name sahuaro, is one of the most remarkable of plants and the most striking element in the desert vegetation of the southwest. As pointed out by Dr. D. T. MacDougal, it was probably first observed by Europeans about 1540, when the expedition of Coronado passed through the region which it inhabits; Onate in 1604 passed through the valley of the Bill Williams Fork of the Colorado River in Arizona and noted the plant, and his account is probably the earliest printed record of it (see Journ. N. Y. Bot. Gard. **6**: 129–130). While known to earlier explorers from the Atlantic seaboard, the first specimens of this interesting plant were collected on the expedition of Lieut. W. H. Emory, a military reconnoissance from Fort Leavenworth in Missouri to San Diego in California, during the autumn of 1846, and the plant is frequently referred to in his report. These specimens were sent to Dr. George Engelmann at St. Louis and after a study of them he gave this cactus the botanical name *Cereus giganteus.*

The plant grows on hillsides in southern Arizona, southeastern California and northern and central Sonora, sometimes reaching a height of sixty feet, branching at from twelve to twenty feet above the ground. Travelers through these regions are always impressed by its very unusual form, and many thousands of people have become familiar with it since three plants were brought to the New York Botanical Garden by Dr. MacDougal in the spring of 1902, where they have since been

successfully maintained, flowering every year in late spring and early summer (Journ. N. Y. Bot. Gard. **3**: 96–98). During our study of the North American Cactaceae, which has now extended over several years, the species included by previous students in the genus *Cereus* have been critically examined; most of them have been seen in the living state, and living specimens are now in the conservatories of the New York Botanical Garden, and in those of the United States Department of Agriculture at Washington. As these specimens have come into flower from time to time it has become increasingly evident that the conception of the genus *Cereus* by previous authors has been altogether too broad. This was inferred at the outset of the investigation from a study of the published descriptions and illustrations, and from the fact that the plant-body of species of *Cereus* ranges all the way from slender climbing vines and low tufted plants, up to the magnificent and stately proportions of the sahuaro and of the other gigantic species which inhabit southern Mexico. The type species of *Cereus* is *Cereus peruvianus* Miller, a night-blooming species native of South America, fine large specimens of which may also be seen in the conservatories of the Garden. Some genera have already been suggested as distinct from *Cereus* by one author or another.

The most noteworthy recent study of these plants has been by Mr. Alwin Berger, gardener at the late Sir Thomas Hanbury's famous home at La Mortola, Italy, entitled "A Systematic Revision of the Genus *Cereus* Miller" (Report Mo. Bot. Gard. **16**: 57–86. 1905), which is a great improvement over the preceding discussion of these plants by the late Professor Karl Schumann (Gesamtbeschreibung der Kakteen, ed. 2, 1903), inasmuch as Mr. Berger first definitely groups most of the species into subgenera, more or less well-defined by floral and fruit characters; whereas Professor Schumann was obliged to group them only in series, many of these being very unnatural, and based almost wholly on the plant-body instead of on the inflorescence. Mr. Berger's contribution is a noteworthy advance, and we find ourselves largely in accord with his groupings of the plants, although there are some results in which we are obliged to differ with him,



Courtesy of the Carnegie Institution of Washington.

SPECIMEN OF CARNEGIEA GIGANTEA OF MAXIMUM SIZE, NEAR AGUA CALIENTE, ARIZONA, ON THE SLOPES OF THE CATALINA MOUNTAINS, PHOTOGRAPHED MARCH 25, 1908.

reached mainly from a more complete knowledge of flowers and fruits. Dr. Engelmann in his Synopsis of the Cactaceae of the United States (Proc. Amer. Acad. 3: 260–346. 1856) had earlier indicated some subgenera and had recognized *Cereus giganteus* as belonging to one of these, which he called *Lepidocereus*, a name which it is neither necessary nor desirable to main-

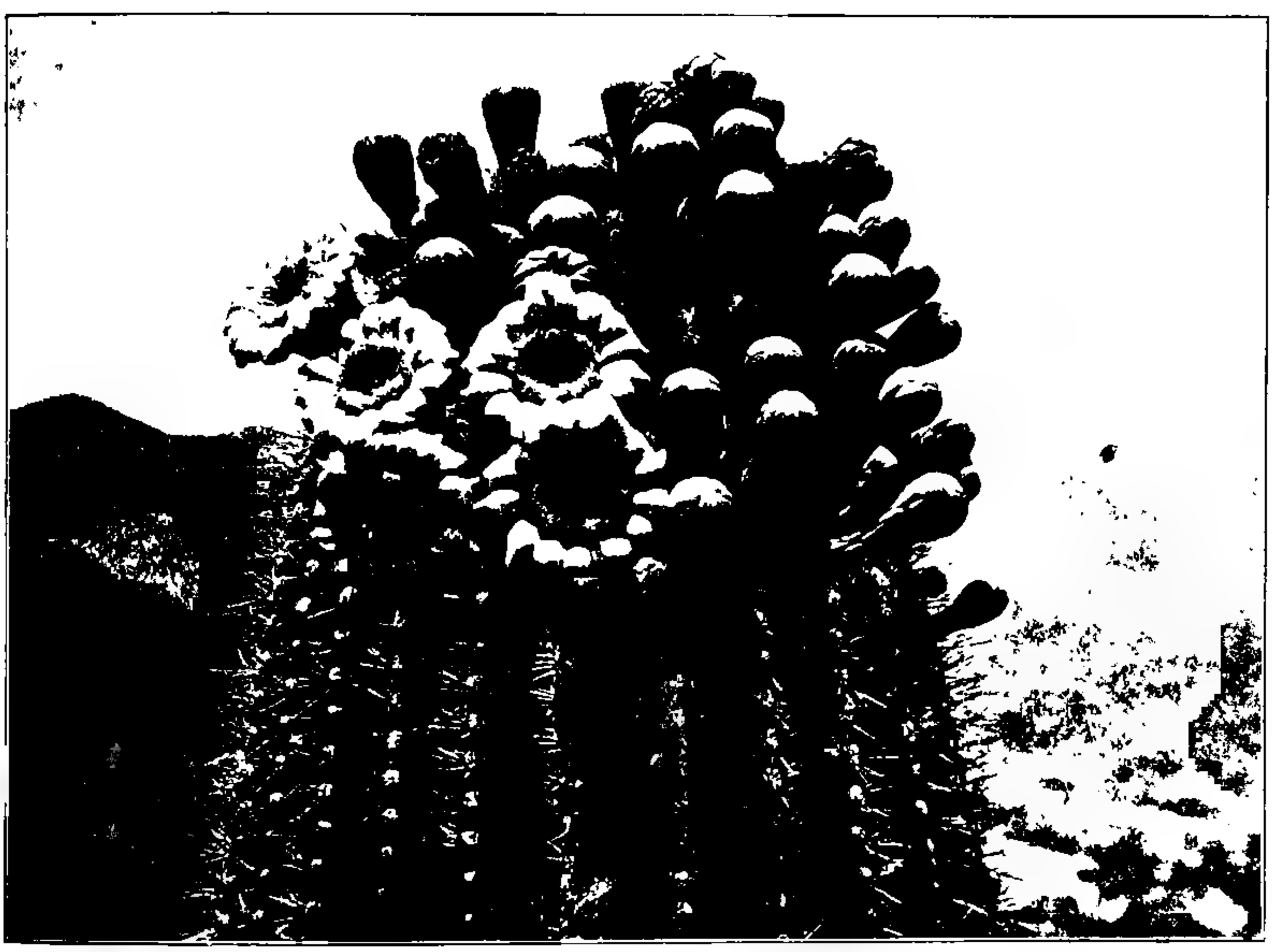


FIG. 32. Cluster of flowers at apex of stem of *Carnegiea gigantea* growing near Tucson, Arizona.

tain; he also included in this subgenus *C. Thurberi* Engelm., native of Sonora and Arizona, which we now know should be excluded, leaving only the sahuaro in the genus which we here propose under the name

CARNEGIEA.

A day-blooming cactus, with stout upright stems and few branches, or none, strongly ribbed, the areoles velvety, close together, and bearing 12–18 spines. Flowers borne at the areoles near the top of the stem and branches, funnelform, the tube

nearly cylindric, about half as long as the limb, bearing a few broadly triangular-ovate acute scales with tufts of wool in their axils; petals white, short, widely spreading and somewhat reflexed when fully expanded; ovary spineless, oblong, with similar scales somewhat closer together; stamens very numerous, about three-quarters as long as the petals; stigmas 12–18, narrowly linear, reaching a little above the stamens; fruit an oblong or somewhat obovoid berry with small distinct scales, its pulp red, the seeds very small, numerous, black and shining. The genus consists only of the species.

Carnegiea gigantea (Engelm.).

Cereus giganteus Engelm. Rept. Emory's Recon. 159. 1848.

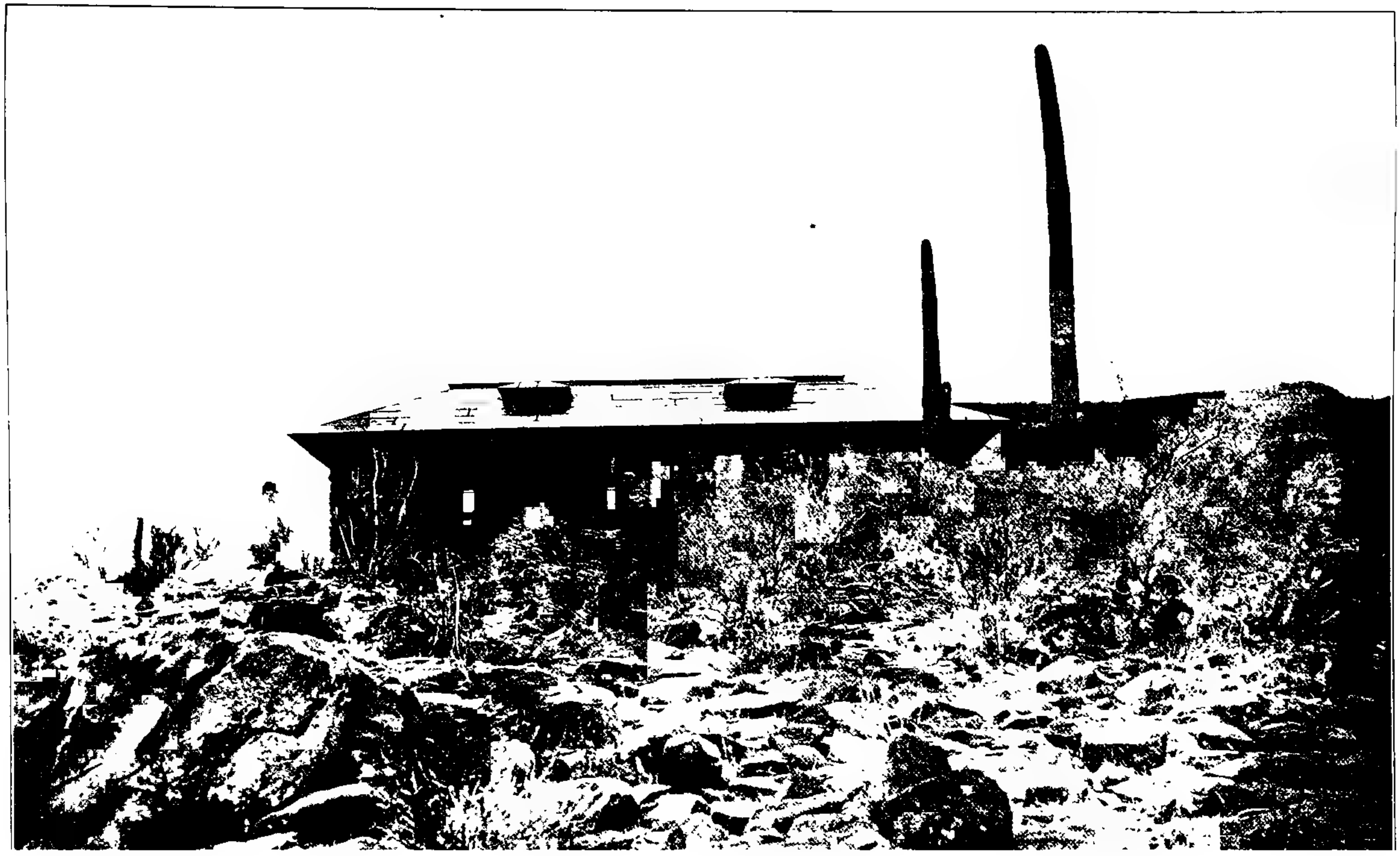
The genus is dedicated to Mr. Andrew Carnegie. The Desert Laboratory of the Carnegie Institution of Washington, at Tucson, Arizona, is surrounded by typical specimens of this unique plant.

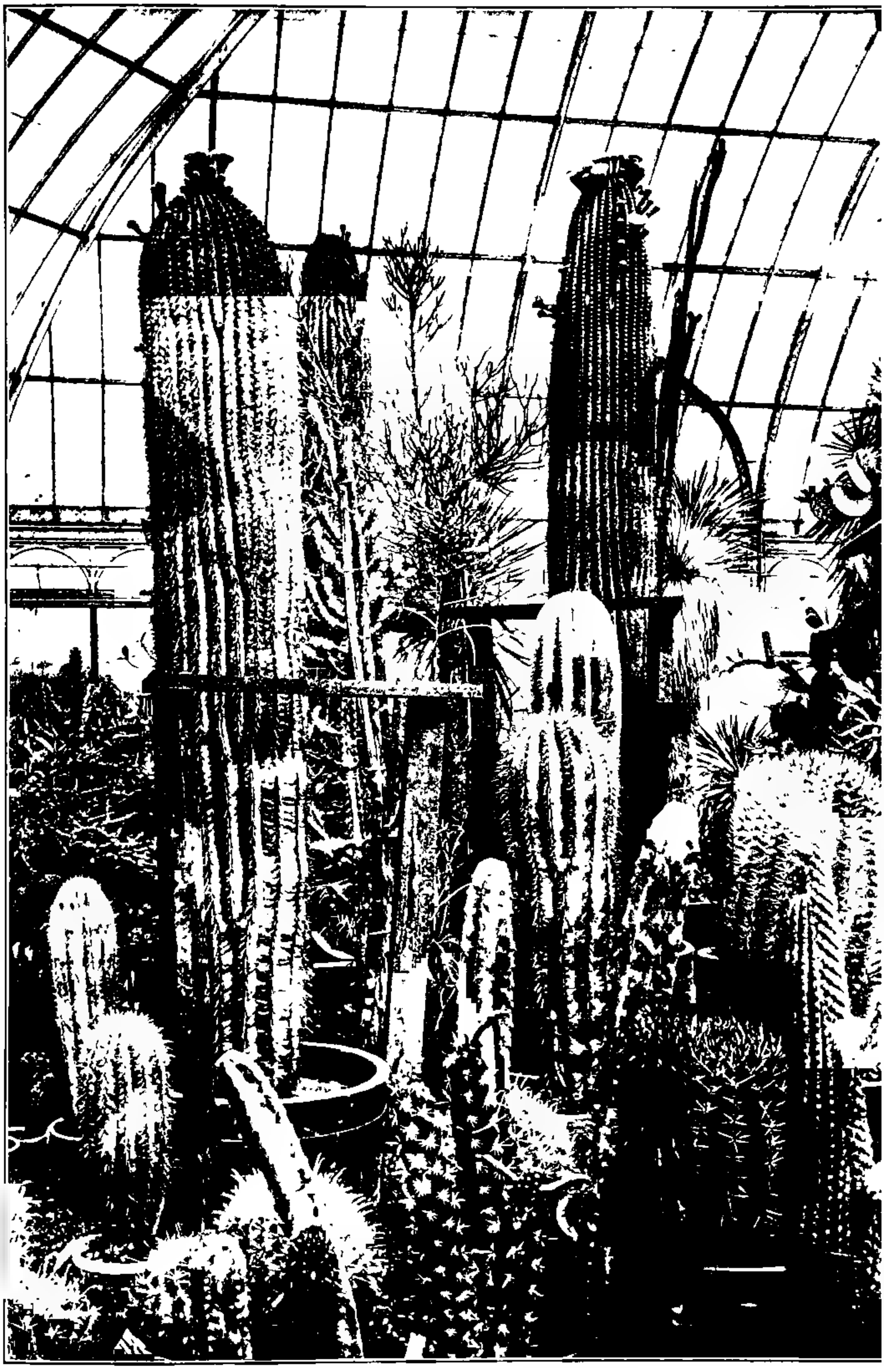
N. L. Britton,
J. N. Rose.

LETCHWORTH PARK AND THE FALLS OF THE GENESEE.*

The Genesee River rises in the northern part of Pennsylvania, in the Allegheny plateau, and during its course of one hundred and twenty-three miles in the state of New York it has a fall of fifteen hundred and fifty-three feet, finally emptying into Lake Ontario at Rochester. This river is unique in two particulars: It is the only river in New York which flows entirely across the state; and it is the only river crossing the southern boundary which flows to the north. For a part of its course it forms the boundary line between the counties of Wyoming and Livingston, and it is to a short distance of this boundary portion, some three miles in length, that I wish to call your attention. Here, in a strife which was begun in ages past, but which is still continued between the waters and the land, this river has cut for itself a deep bed, known as the Portage or Glen Iris gorge, and in this short three miles is comprised some of the most striking and magnificent scenery in the eastern United States, being second only to

* From a lecture delivered at the New York Botanical Garden, October 31, 1908.





SPECIMENS OF CARNEGIEA GIGANTEA COLLECTED NEAR TUCSON, ARIZONA, IN 1902 IN BLOOM IN THE CONSERVATORIES OF THE NEW YORK BOTANICAL GARDEN.

that of Niagara, which, though more imposing and on a grander scale, must perhaps give way in some respects to its smaller rival.

To this place, about the middle of the last century, was attracted a gentleman destined to be one of the great men of New York — a man of deep charity and broad human interest — a descendant from sturdy Quaker stock. This man is the Hon. William Pryor Letchworth, for a long time a member of the state board of charities, and for many years its president. A gentleman of the old school, courteous and kindly, with an open hospitality which makes the guest feel at once at home, and with a broad human sympathy which embraces all mankind — to know this gentleman is indeed a privilege.

To this man the state, the nation too, owes a debt of gratitude, for to his generosity the people of the country are indebted for a gift of almost priceless value. As will be shown in detail below, Mr. Letchworth has given to the state of New York, for all time, the beautiful tract of land, containing over one thousand acres, now known as Letchworth Park, including within its confines all three of the falls of the upper Genesee.

It was in 1859, about two years after the Hon. Andrew H. Green, a kindred spirit, had begun improvements in our own Central Park, that Mr. Letchworth made his first purchase of land along the Genesee. From time to time since then he has made additions to this original acquisition, until now, as stated above, the tract comprises over one thousand acres, and upon its acquisition and improvement there have been expended by Mr. Letchworth over five hundred thousand dollars. At the time of its purchase it had been devastated by lumbermen, and the tract was littered with only such refuse as a lumberman, in his greed for gain, can make — old limbs and branches, rotting logs, chips and stumps. All vestiges of these have been removed and in their place have appeared stretches of new timber, carefully preserved, and paths and driveways affording access to the beauties of nature here so lavishly displayed.

From its very inception, Mr. Letchworth has designed his estate as a public park, and the public has at all times been welcome to it. The immediate surroundings of his home have

been restricted, but to all other parts visitors have had free access. His home is known as Glen Iris, a name early conferred upon it by Mr. Letchworth, suggested by the beautiful rainbows which form constantly on bright days in the mists which rise from the middle fall.

From a private park, private only in the sense that it belonged to a private citizen, it was but a step to the broader outlook of a public park, and eventually we find Mr. Letchworth seriously considering the step to which I have already alluded — its free gift to the state as a public park or reservation. A committee of influential men was appointed, and after consultation with them this step was taken. On December 14, 1906, this committee called on Governor Hughes, explaining their mission, and it is said that he responded as follows: "In the midst of so many calls from people who are asking for something *from* the state, it is a novel and delightful sensation to have some one offer to give something *to* the state. This is certainly a most generous benefaction." On January 10, 1907, a bill was introduced into the legislature providing for the acceptance of this gift. A week later the assembly passed this unanimously, but in the senate opposition developed. An amended bill was there proposed, but, on the insistence of Mr. Letchworth, the original bill was finally passed by that body on the twenty-third with but four opposing votes, and on the twenty-fourth it became a law by the addition of the governor's signature.

The bill provides that "the land therein conveyed shall be forever dedicated to the purpose of a public park or reservation, subject only to the life use and tenancy of said William Pryor Letchworth, who shall have the right to make changes and improvements thereon." The bill also provides that after the death of the donor, control and jurisdiction of the tract shall be in the hands of the American Scenic and Historic Preservation Society, of which Mr. J. Pierpont Morgan is honorary president, and Mr. Geo. F. Kunz, the noted gem expert, president, thus placing it in safe hands. Early in February the senate and assembly adopted a concurrent resolution conferring the name of Letchworth Park upon this tract in honor of its donor.

That this park might be made of even greater service to the public, by emphasizing its educational side, Mr. Letchworth wished to have a study made of the arboreal vegetation in the park and the trees properly labelled. Dr. N. L. Britton, the Director-in-Chief of the Garden, was consulted in this matter, with the result that I was selected to visit the park and consult with Mr. Letchworth in reference to this. My first visit was made in the fall of 1907, and a sample of the label used on the trees in the New York Botanical Garden was submitted. Mr. Letchworth approved of this, and during July of the present year I made a second visit for the purpose of superintending the affixing of a number of labels of this type.

With this brief account of the history of Letchworth Park, I wish now to describe to you, with the aid of a few illustrations, some of its beauties and points of interest. A reference to the accompanying map will help make clear the positions of the various places mentioned.

From New York City the region is reached most conveniently by the Erie railroad. Leaving the train at Portage, which is on the Livingston county side of the river, a short walk brings us to the long viaduct, upon which the railroad crosses the Genesee. From the middle of this structure, which is two hundred and thirty-four feet above the level of the river, a magnificent view of the Genesee gorge may be had. Before us to the north, as far as the eye can see, lies a beautiful panorama of undulating hills and forest stretches, with the gorge and river winding like a narrow ribbon to the north. About five hundred feet from the viaduct the Genesee takes its first plunge, a cloud of spray and rising mists marking the position of the chasm into which the river leaps. This is known as the upper fall. Away to the northeast, about twenty-one hundred feet beyond the upper fall, another cloud of mist and spray reveals the spot where the river takes its second plunge, this being known as the middle fall. It is but a few hundred feet from this, on the left bank of the stream, that the residence of Mr. Letchworth is located. Between this and the third and last fall, out of view beyond the distant bend, lies the picturesque gorge of the Genesee.

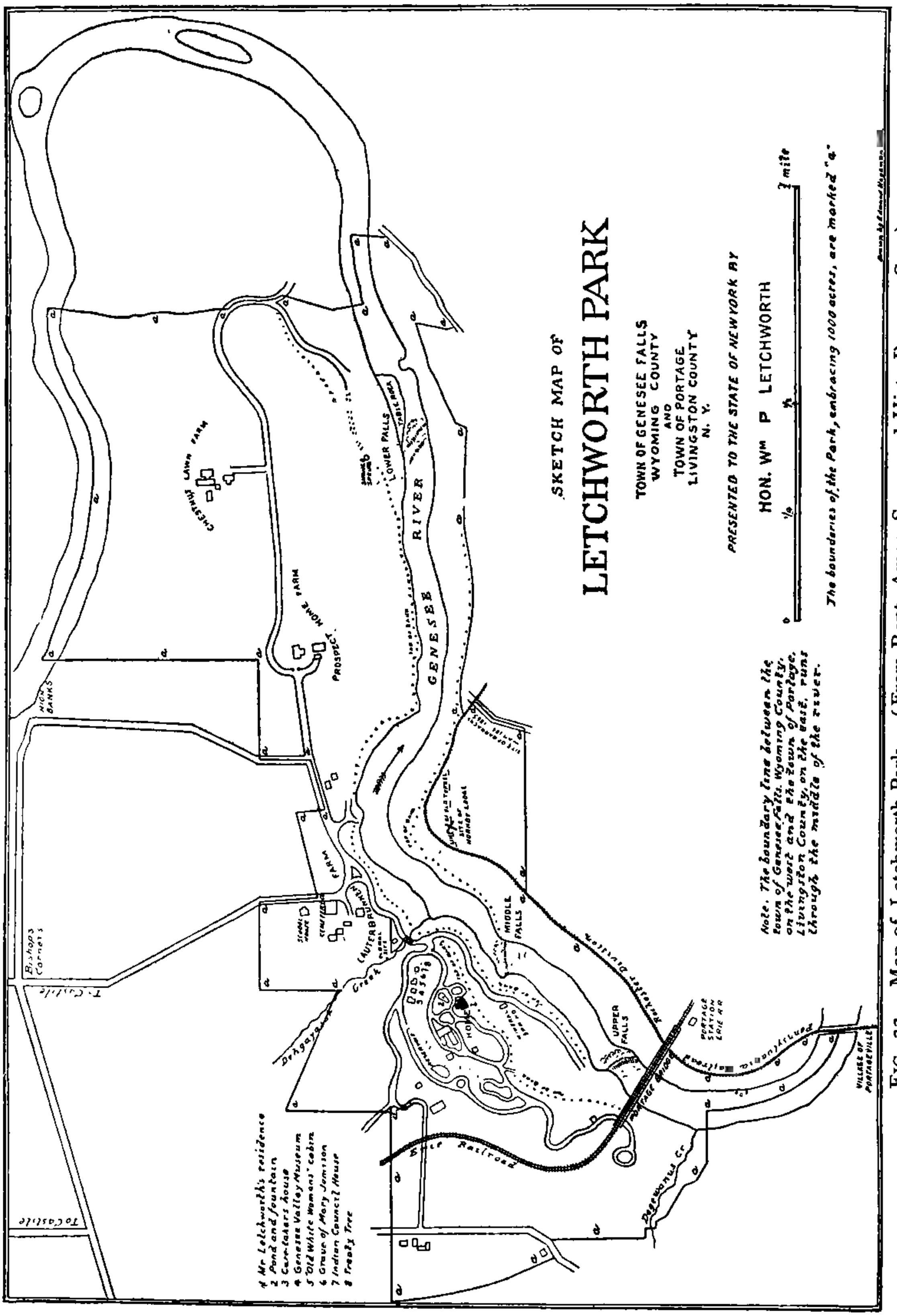


FIG. 33. Map of Letchworth Park. (From Rept. Amer. Scen. and Hist. Preserv. Soc.)

At the further end of the bridge will be found a series of steps and galleries which will conduct us to the vicinity of the upper fall. About half way down these we come to the falls of the De-ge-wa-nus, a small stream which empties into the Genesee at this point, and a little later to the picnic grounds. Here tables and benches have been provided for visitors, and hitching posts for horses, for many people drive from the surrounding country to see these falls. At this point glimpses may be had of the upper fall, but if one really wants to enjoy its grandeur,

FIG. 34. Upper fall, seventy-one feet in height, veiled in its own mist.

let him pick his way carefully along the slippery and stony bank of the west side of the stream until he comes to a vantage point from which he may view the fall as seen in the above illustration. Along the west bank the road continues, and soon we hear the roar and see the mists of the middle fall, the greatest of the three. From an observatory on a small rocky plateau at the very brink of the fall, an impressive view may be had of the great volume of water as it drops over the precipice to the river about one hundred and seven feet below.

Leaving the little observatory, the path follows along the brink of the gorge to a point on the cliff not far from the residence of Mr. Letchworth, where we get a magnificent view of the gorge, looking northeast. The accompanying illustration gives some idea of this, but only a visit to the spot will make one realize its beauties. On either side are perpendicular walls of rock, beautifully variegated by alternating strata of shale and sandstone, rising to a height of three hundred and fifty feet, twenty feet higher than the palisades opposite New York City, crowned on the left bank with a mass of vegetation to an additional height of one hundred and fifty feet, making the total on that side nearly five hundred feet.

This gorge of the Genesee is often known as the Portage gorge, and these rocks, laid down nearly fifty million years ago, belong to the Portage epoch of the upper Devonian age. Most of what is now New York state then lay under a vast sea. The rivers of what land there was at that time washed their sediment down into this apparently shallow sea where it settled and formed not only the Portage rocks but also others of central and western New York. As time passed on, other and more modern strata were laid down on this Portage formation, burying it out of sight. Ages passed, and finally came a great upheaval of the continent, when the bottom of this sea was raised up and dry land was formed. As the center of this upheaval was to the north, the strata, which were formerly horizontal, assumed a gentle dip to the south. Then the elements attacked the land; the winds and the rains and the floods came and washed and eroded, until finally in millions of years the Portage rocks were again brought to view.

About the time of the glacial age a great depression occurred in the north, reversing the inclination of the land, making the rivers which formerly flowed to the south now take a northerly direction. But the glaciers, stopping up the valleys with their debris, formed large lakes, and one of these was located in the large basin-like area, a part of the old Genesee valley, to the south of the present Portage gorge. As the depression continued in the north, this lake began to overflow, naturally at the

lowest point in its brim, which happened to be not at the region of the old valley, but at the site of the present gorge. This stream, probably at first but a small brook, following the line of least resistance, gradually wore for itself a tortuous channel, sinking it deeper and deeper as the years went by, until it formed and is still forming for itself the deep channel known as

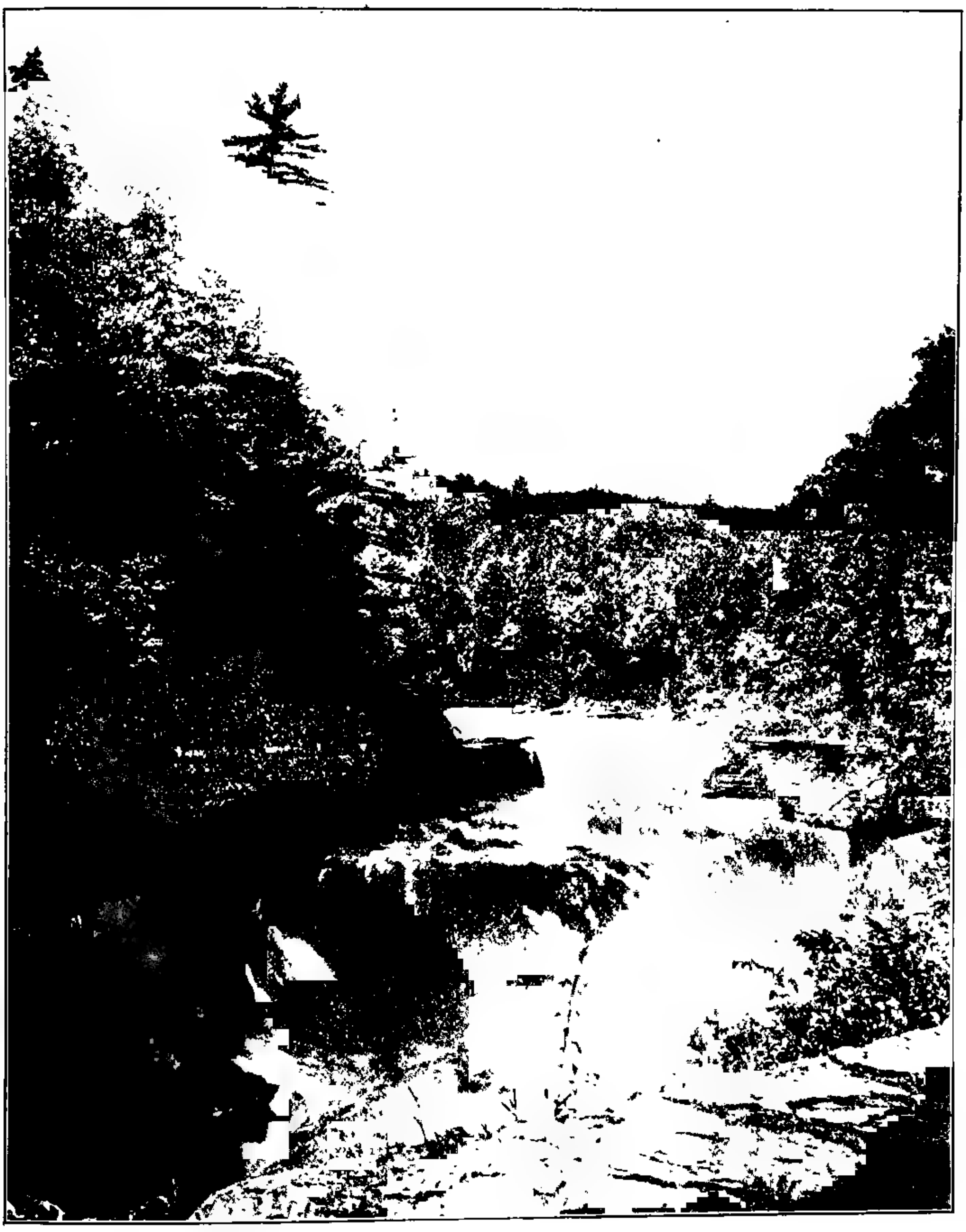


FIG. 35. Lower fall, looking up-stream from table rock, the separation into two cascades clearly shown.

the Portage gorge. At first there was probably but one fall, but, owing to the variation in the hardness of the strata, which wore away unevenly, the original fall began to split into two and then into three falls, and these are still changing their relative positions.

Leaving this interesting spot and continuing along the path which skirts the gorge, a walk of about one and a half miles brings us to the plateau above the lower fall. From this place a series of stairs and galleries descend to the bottom of the gorge, and bring us into a magnificent strip of old timber, consisting of large tulip-trees, hemlocks, maples, and other splendid trees. It is a delight to see this old timber, preserved from the devastating hand of the lumberman by obstacles thrown in the way by nature. On the one side is a tall cliff, now clothed with verdure, and on the other the raging waters of the river, two obstacles which the lumberman could not surmount, and so we have left to us a remnant and a reminder of what this whole region once was.

Passing through this strip of forest by a delightful woodland path, we suddenly emerge upon the brink of the chasm through which rush the waters of the lower fall. The view here presented of this fall is that which one sees from the upper end of Table Rock, displaying both cascades. Here is demonstrated the manner in which the three falls have separated, for you see the first step of the process, the breaking up of the lower fall into two cascades. In time these will separate more and more, and there will be four falls instead of three.

Two of the most interesting features of the lower fall region are Table Rock and Cathedral Rock, shown in the accompanying illustration. Many years ago Professor Hall said of Table Rock: "The table above, which was formerly the bed of the river, will in a few years become covered with soil and vegetation; strong grass and willows will have taken root in the fissures, and these collecting about them a little earth, giving a soil for the support of other plants, the evidence of its original condition will be lost. A century hence, some incredulous observer may stand on the edge of Table Rock, then covered with shrubs and trees, and deny that the insignificant stream flowing in its bed

can have excavated this deep chasm. An observer of similar disposition may now stand on the margin of the great gorge of the Genesee at Portage and say that it is impossible for this river to have worn it to the depth of 350 feet and a breadth of 600 feet. But the Genesee was once a more powerful stream, and it has flowed in its present direction longer than we are usually accustomed to consider as the age of the world." How true this prophecy was is evidenced by the trees and shrubs, and grass and other herbs now securing a firm foothold on this plateau.

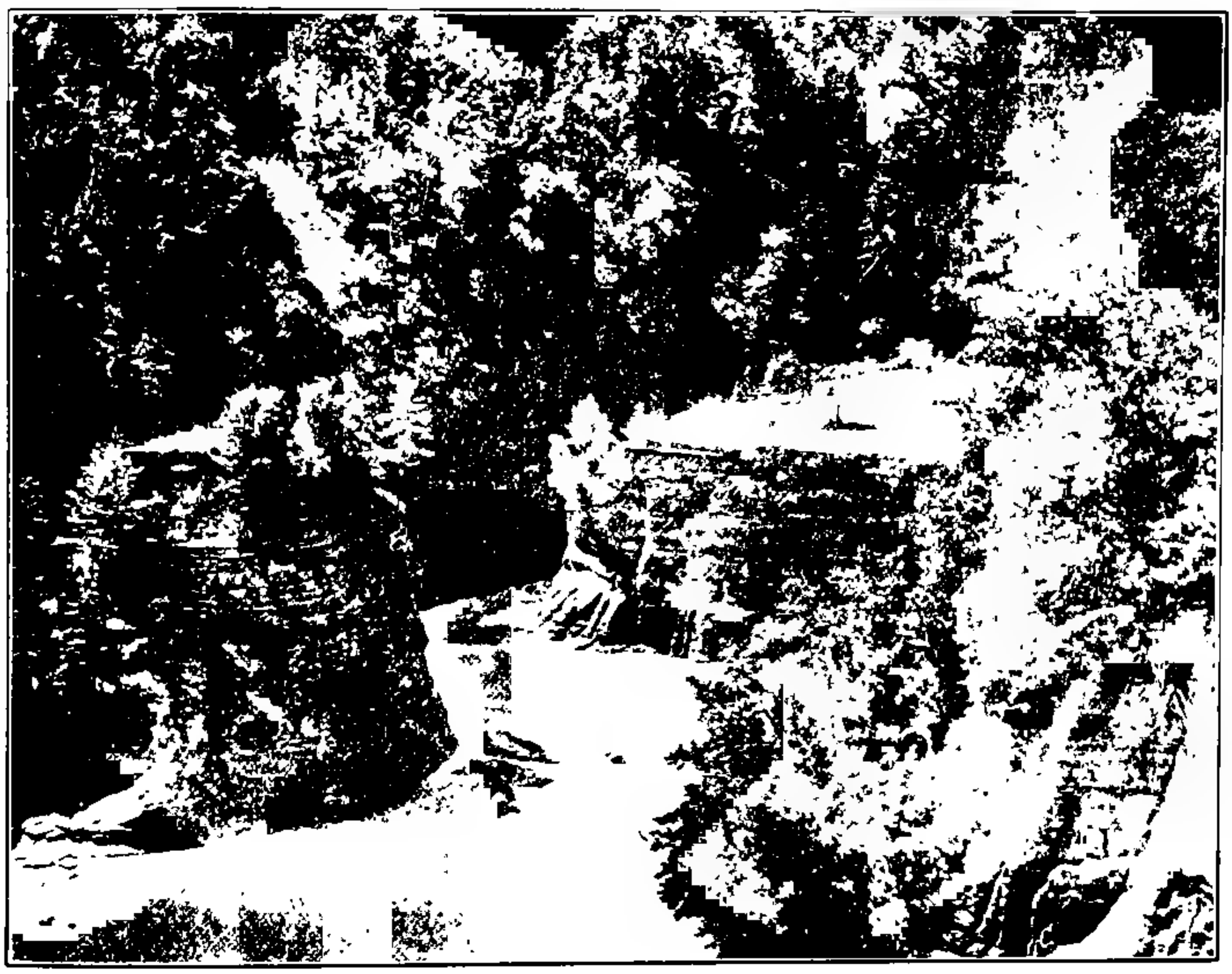


FIG. 36. Table rock, with the flume to the left, and cathedral rock, as seen from the left bank.

Leaving this beautiful region of the lower fall, we will return to the upper portions of the park, traversing this time, however, not the path along the brink of the gorge, but the road inland which passes through the farm lands, comprising several hundred acres of the estate. To the right of this road which parallels the Genesee, we see the Chestnut Lawn Farm, equipped as a modern dairy, while opposite to this, on the other side of the

road, is the Prospect Home Farm, and beyond these the Lauterbrunnen Farm.

It is but a short step from this last farm to the residence of Mr. Letchworth. Here we find a commodious house with an ample porch on two sides, with large columns running up for two stories, so that many of the sleeping apartments look out upon it. To one side, between the residence and the front gate, is a little pond with a fountain playing continuously, fed by a perennial spring in the hillside near by. This fountain seems to be a vista-point, for it may be seen here and there from various parts of the grounds. Large evergreen and deciduous trees surround the house, among them a fine American elm and some magnificent specimens of the Norway spruce, perfect in shape and branched entirely to the ground, their long branches trailing in the grass. From the group of trees surrounding the house spread broad lawns, the planting so arranged as to form charming vistas, which terminate in many cases in the woodland beyond. The open stretches of lawn contain no flower beds, and the shrubbery does not obtrude and detract from the harmony around. Along the brink of the gorge trees have been planted, with openings here and there, so that beautiful vistas upon the falls and gorge meet the eye as one strolls along the paths. All trees and shrubs not native to the vicinity are confined to the regions in the immediate neighborhood of the residence, so that the woodlands beyond contain native plants only. It is a delight to walk through these woods and see the tulip-trees, white pines, Norway pines, cucumber-trees, elms, oaks, chestnuts, beeches, hornbeams, butternuts, and many other trees, natives of this region, in such great abundance.

One of the roads through these woodlands finally leads us to the Council House Grounds, one of the most interesting features of the park. Here will be found an old Indian council house, from which the reservation takes its name. This building, constructed of hewn logs, is about forty feet long and seventeen feet wide. Its exact age is uncertain, but it is known to antedate the revolution. It is a work of the Seneca Indians, and was formerly located at Caneadea, or Ga-o-ya-de-o, the uppermost of their

villages on the Genesee, about eighteen miles from its present location. It was falling to decay when Mr. Letchworth decided to remove it to its present site in 1871. In taking it down each part was carefully numbered so that it might be put together exactly as it was originally.

The Senecas were one of the five nations which composed the league of the Iroquois, the other four being: the Mohawks, Oneidas, Onundagas, and Cayugas. Of these the Senecas were the most numerous, enterprising, and chivalrous, and were set to guard the western door of the confederacy. They were organized, devoted to agriculture, and were great orators. As Caneadea was in the southwestern border of the Seneca country, it was a convenient rendezvous of war-like parties passing to their fights in Ohio and Pennsylvania.

On October 1, 1872, the last council of the Senecas was held in this house, nineteen warriors, a mere remnant, being present from the neighboring reservation. At this council the Indians urged Mr. Letchworth to consent to adoption into the Seneca nation, which was their way of showing appreciation of his devotion to the interests of the Indians, for whom he had done so much. Mr. Letchworth, however, declined. That evening he was surprised by a visit from them, when they repeated their request, to which he acceded, the ceremony being performed on his front porch. As was their custom on such occasions, they bestowed on him a name — Hai-wä-ye-is-tah — meaning, "the man who always does the right thing."

Not far from the council house is the "White Woman's Cabin," and near by the grave of Mary Jemison. The house was built by Mary Jemison for one of her daughters on the Gardeau reservation. The monument in front of this house was erected by Mr. Letchworth to her memory. Upon this are two inscriptions which tell the story of her life among the Senecas.

At the further end of the Council House Grounds is a section of the big treaty oak which formerly stood on the banks of the Genesee below Mt. Morris, opposite Geneseo. This tree stood near where the treaty was made transferring practically all of the land west of the Genesee to the whites. It took place in 1797,

in the presence of three thousand Indians, and consumed twenty-one days. Four million acres were disposed of for $100,000. This amount was placed in trust in the hands of the government, and the interest is still paid on it as an annuity to the Indians.

The Genesee Valley Museum contains many objects of interest relating to this section, among which are numerous Indian relics; also the head of a large mastodon, found about seven miles from Glen Iris in 1879, and purchased by Mr. Letchworth.

FIG. 37. Middle fall and the view up-stream, as seen from the lawn in front of the residence of Mr. Letchworth.

Before leaving Letchworth Park, let us descend the charming woodland path which connects this reservation with the home grounds and take a farewell look at the middle fall, which is shown in the last illustration. Here we are standing on the edge of the lawn, but a few feet from the south porch, looking up the gorge of the Genesee. Below, but a few hundred feet away, is the middle fall, sending up its clouds of mist and spray, which, on windy days, is blown upon the house near by, and in which, when

the sun is shining, rainbows come and go. To the right is the little observatory, just on the brink of the fall, from which we have looked out upon the waters as they plunged below. Further on we see the hazy distance of the other shore, and still beyond the mist rising from the upper fall to the railway viaduct above. This is the view which Mr. Letchworth has looked upon for many years and of which he is very fond.

GEORGE V. NASH,
Head Gardener.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton spent November 18 and 19 in Washington and Baltimore examining collections of cacti, and in attending a meeting of the Committee on Policy of the American Association for the Advancement of Science.

Dr. W. A. Murrill visited Harvard University November 7 to examine types of certain Boletaceae in the Farlow collection.

The autumn course of lectures to the 4 B and 5 B pupils of the public schools of Bronx closed November 10. No postponements on account of rain were necessary during the entire course, and on only one occasion was the attendance materially reduced by threatening weather.

An interesting and unique celebration will be held on the estate of Mr. George W. Vanderbilt at Biltmore, North Carolina, during the Thanksgiving holidays, commemorating the twentieth anniversary of the beginning of practical forestry at Biltmore and the tenth anniversary of the Biltmore Forest School.

The regular autumn course of public lectures delivered in the large hall of the museum building on Saturday afternoons closed November 21 with Dr. H. H. Rusby's lecture on "The Rubber Plants of Mexico." These lectures have been well attended.

The first botanical convention of the present collegiate year was held in the library on the afternoon of Wednesday, November 4. Mrs. N. L. Britton gave an account of her recent collections in Jamaica; Mr. E. W. Humphreys described an inter-

esting analogy existing between fossil plants and those now living; Mr. F. J. Seaver showed specimens of some fungi collected by him in North Dakota; and Mr. G. V. Nash exhibited a living specimen of *Stangeria*, a peculiar cycad obtained in Europe in 1902.

An interesting plant of the genus *Stangeria*, a native of southern Africa, may be seen among the cycads on the east side of house No. 1 of the public conservatories. Unlike all the other genera of the sago-palms, this one has pinnately veined leaflets, giving it much the appearance of some ferns. It was from this resemblance that Kunze, many years ago, named a leaf of this plant *Lomaria eriopus*. Living plants were brought into cultivation, which, on producing cones, disclosed the real nature of this plant. The name *Stangeria paradoxa* was then given to it, but the specific name must now give way to that used when it was described as a *Lomaria*. A young cone may be seen on the plant.

The total precipitation recorded at the Garden for October was 1.46 inches. Maximum temperatures were recorded of 75° on the 4th; 76.3° on the 11th; 88° on the 17th; 74.5° on the 19th, and 67° on the 26th; also minimum temperatures of 36° on the 3d; 39.5° on the 6th; 31° on the 13th; 37° on the 22d, and 34° on the 31st. Mean temperature for the month, 59.5°. First frosts occurred about the middle of the month.

ACCESSIONS.

LIBRARY ACCESSIONS FROM OCTOBER 1 TO OCTOBER 31, 1908.

BERGER, ALWIN. *Mesembrianthemen und Portulacaceen.* Stuttgart, 1908. (Given by Dr. N. L. Britton.)

BOULANGER, EMILE. *Notes sur la truffe.* Lons-le-Saunier, 1906. (Deposited by the Trustees of Columbia University.)

ENGLER, HEINRICH GUSTAV ADOLF. *Die Vegetationsformationen tropischer und subtropischer Länder.* Leipzig, 1908.

HENSLOW, GEORGE. *The heredity of acquired characters in plants.* London, 1908.

JONGKINDT CONINCK, A. M. C. *Dictionnaire Latin-Grec-Français-Anglais-Allemand-Hollandais, des principaul termes employés en botanique et en horticulture.* Bussum, 1907.

KRAEMER, HENRY. *A text-book of botany and pharmacognosy.* Ed. 3. Philadelphia, 1907. (Given by the Torrey Botanical Club.)

LERENARD, ALFRED. *Essai sur la valeur antitoxique de l'aliment complet et. incomplet.* Paris, 1907. (Deposited by the Trustees of Columbia University.)

SAGRA, RAMON DE LA. *Histoire physique, politique et naturelle de l'ile de Cuba. botanique.* Paris, 1838–45. 2 vols. (By exchange with the Department of Agriculture, Jamaica.)

SENN, GUSTAV. *Die Gestalts- und Lageveränderung der Pflanzen-Chromatophoren.* Leipzig, 1908.

Zeitschrift für induktive Abstammungs- und Vererbungslehre. Band 1, Heft ½ Berlin, 1908.

MUSEUMS AND HERBARIUM.

113 specimens of mosses from Japan and Korea. (By exchange with Mr. J. Cardot.)

92 specimens "Uredineen," Fasc. 44 & 45. (Distributed by Professors H. & P. Sydow.)

3,000 herbarium specimens from Jamaica, W. I. (Collected by Dr. and Mrs. N. L. Britton.)

1 specimen of *Eruca sativa* from Pennsylvania. (Given by Messrs. J. M. Thorburn & Co.)

10 specimens of flowering plants from Galt, Ontario. (Given by Mr. W. Harriot.)

50 specimens "Musci Frond. Archipelagi Indici et Polynesiaci." (Distributed by Professor Max Fleischer.)

7 specimens of hepatics. (Given by Miss Annie Lorenz.)

54 specimens of mosses from the Himalaya Mountains. (By exchange with the Royal Gardens, Kew, England.)

32 specimens "Musci Norvegici." (By exchange with Dr. N. Bryhn.)

5 specimens "Hepaticae Canariensia." (By exchange with Dr. N. Bryhn.)

1 specimen of *Picea* from Keewatin. (Given by Mr. S. S. Cummins.)

7 specimens of flowering plants, co-types, from New Mexico. (Given by Professor E. O. Wooten.)

2 specimens of *Aragallus* from North Dakota. (Given by Professor H. F. Bergman.)

600 herbarium specimens from New York, Virginia, Tennessee and North Carolina. (Collected by Dr. P. A. Rydberg.)

4 specimens of *Phragmites aquehongensis*, tertiary (?) fossil plants. (Given by Dr. A. Hollick.)

8 specimens of fossil plants from the eastern United States. (Given by Dr. A. Hollick.)

190 specimens of cretaceous fossil plants from Long Island and Martha's Vineyard. (By exchange with the U. S. Geological Survey.)

PLANTS AND SEEDS.

2 cactus plants for conservatories. (By exchange with United States National Museum, through Dr. J. N. Rose.)

1 orchid for conservatories. (Given by Mr. J. C. Zeladon.)

3 plants of *Pandanus utilis* for conservatories. (Given by Mrs. John H. Hall.)

1 plant of *Livistona chinensis* for conservatories. (Given by Mr. W. H. Mehlich.)

1 plant of *Beaucarnea recurvata* for conservatories. (Given by Mr. J. Chr. G. Hupfel.)

erns for conservatories. (Given by Miss Margaret Slosson.)

14 cacti for conservatories. (By exchange with Mr. F. Weinberg.)

16 plants for the herbaceous collections. (Collected in the old nursery.)

60 plants for conservatories. (Collected in Jamaica by Dr. and Mrs. N. L. Britton.)

2 packets of *Crataegus* seed from Montana. (Given by Mr. B. T. Butler.)

33 packets of *Rubus* seed. (Collected by Dr. P. A. Rydberg.)

50 plants derived from seed from various sources.

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Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations carried out in the Garden. Free to all members of the Garden; to others, $3.00 per volume. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Vol. II, Nos. 6–8, 518 pp., 30 plates, 1901–1903. Vol. III, Nos. 9–11, 463 pp., 37 plates, 1903–1905. Vol. IV, Nos. 12–14, 479 pp., 14 plates, 1905–1907. Vol. V, No. 15, 105 pp., 1906; No. 16, 88 pp., 17 plates, 1906; No. 17, 115 pp., 1907. Vol. VI, No. 19, 114 pp., 1908.

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Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

Vol. 25, part 1, issued August 24, 1907. Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908, contains descriptions of the family Grossulariaceae by F. V. Coville and N. L. Britton, the Platanaceae by H. A. Gleason, the Crossosomataceae by J. K. Small, the Connaraceae by N. L. Britton, the Calycanthaceae by C. L. Pollard, and the Rosaceae (pars) by P. A. Rydberg.

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Vol. IX DECEMBER, 1908 No. 108

JOURNAL

OF

The New York Botanical Garden

EDITOR

WILLIAM ALPHONSO MURRILL

Assistant Director

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JOURNAL

OF

The New York Botanical Garden

VOL. IX. December, 1908. No. 108.

EDIBLE MUSHROOMS IN BRONX PARK.

The popular interest in mushrooms of all kinds is almost phenomenal. This is due to their beauty of form and color and the supposed mystery surrounding their origin and growth, as well as to the use of certain kinds for food. Their nutritive value is not great, being about equal to that of cabbage, but they afford variety in flavor and add greatly to the relish for other foods.

Mushroom eating is much more in vogue in Europe than in this country. The struggle for existence is greater there, and the edible and poisonous varieties are better known by all classes of people. In China it is almost impossible for a botanist to get specimens, on account of the thorough manner in which all wild food is collected by the natives.

The use of mushrooms in this country is as yet very limited, being confined chiefly to our foreign-born population. Even in New York City many excellent kinds go to waste every season because they are different from kinds known in Europe. This is especially true of the puffballs, which do not seem to be generally recognized here as edible. On the other hand, many species are collected in a wholesale and indiscriminate manner by ignorant foreigners, who, while searching the lawns for the common mushroom and the stumps for the "beefsteak" mushroom and the honey agaric, appear to gather everything they find at all resembling edible forms known to them.

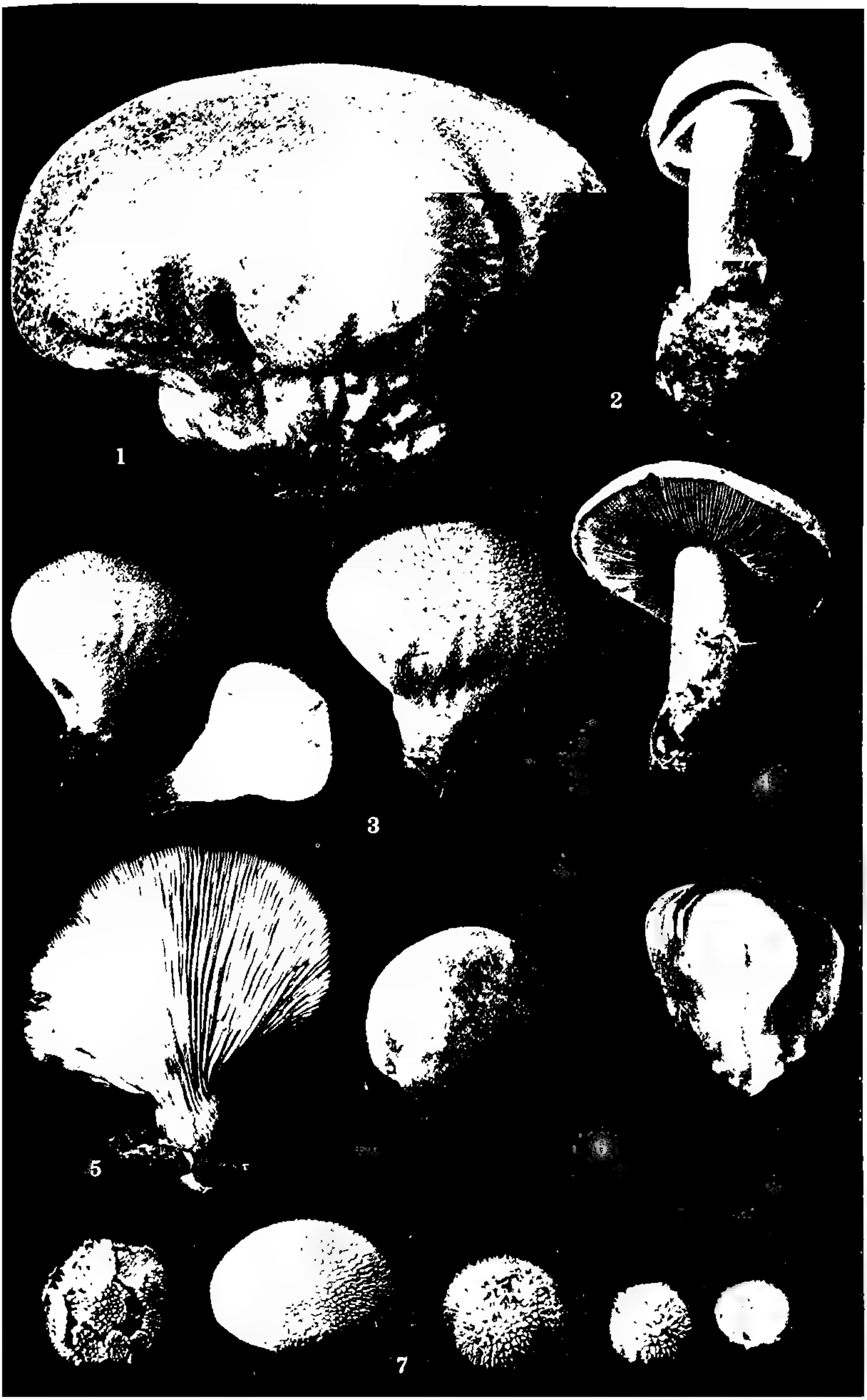
All knowledge regarding the edible and poisonous properties of mushrooms is based on experiments, either intentional or un-

intentional. The only safe rule is to confine oneself to known edible forms until others are proven harmless. If one is a beginner, he is like an explorer in a new country with an abundance of attractive fruit near at hand, which may be good or may be rank poison; he cannot tell without trying it, unless some native, who has learned from his own and others' experience, shares his knowledge with him.

The writer on this subject undertakes a very responsible task, owing to the vast number of similar forms among the mushrooms which are distinguished with difficulty by those not accustomed to fine distinctions; but it should be possible to describe a few striking kinds in such a way that no serious mistakes will be made.

The common field mushroom (Pl. 55, fig. 4) is known to almost everyone who pretends to collect mushrooms at all, and the majority of collectors limit themselves entirely to this one kind. It grows in low grass on meadows or on rich, moist upland pastures, being common after rains from August to October. The upper side is white with brownish fibrils or scales, and the under side is a beautiful salmon-pink when young, changing gradually to almost black when old. The stem is colored like the top and has a loose white ring around it. There is little or no swelling at the base of the stem and no "cup," as in the deadly amanita, which latter, moreover, is white underneath and grows usually in woods or groves.

The "spawn," or vegetative portion of the common mushroom, is hidden in the soil and feeds upon the dead organic matter found therein. When the proper season arrives, small fruit bodies, known as "buttons," appear on the spawn and soon develop into "mushrooms," which are in reality only the mature fruit bodies of a delicate and widely branching plant entirely concealed in the earth. The parts of the fruit body are known as the "stem" and the "cap." On the under side of the cap are the "gills," which bear countless tiny bodies known as "spores," which are distributed by the wind and produce new plants as seeds do in the case of flowering plants. The cottony "ring" on the stem is what remains of a thin white "veil" which cov-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ered the gills in the younger stages of growth. This veil is not present in all kinds of mushrooms.

In the cultivation of the common mushroom, bricks of spawn are planted in suitable soil and the conditions of growth attended to with great care. Anyone wishing to grow mushrooms should provide himself with a good handbook on the subject, or learn the secret from a practical man in the business. It is not easy to do successfully unless done properly.

"Here's a destroying angel with its head broke off," shouted my small companion as we entered a beautiful oak grove in search of mushrooms. And, as we passed through, we found that several other "angels" had lost their heads, leaving the large "death-cups" almost hidden in the thin grass and leaf-mould where they grew. Evidently, this most poisonous of all mushrooms, the deadly amanita, had gone to grace somebody's feast,—and a single specimen of it is sufficient to kill four or five persons!

I have frequently noticed a tendency in young or inexperienced persons to belittle the dangers of mushroom eating, apparently believing that a show of bravado or fearlessness will overcome the effects of the poisonous kinds, as though they belonged to the category of myths or ghosts. It is, indeed, true that many varieties have been called poisonous when they were not, just as most of our snakes have been under the ban on account of the mischief done by three or four; but there are a few mushrooms that contain poisons just as deadly as that of the rattlesnake or copperhead, and these are responsible for practically all of the deaths due to mushroom eating. These poisons are narcotic, rather than irritant, and their effects are slow to appear.

If distress is experienced within four or five hours after eating mushrooms, it is a case of indigestion or minor poisoning and should readily yield to a prompt emetic. If, however, from eight to twelve hours have elapsed since eating the mushrooms, disagreeable symptoms should be taken very seriously, since it is almost certain that one of the deadly poisons is at work. A physician should at once be called and the heart action stimulated by a hypodermic injection of about one sixtieth of a grain of atropine, which should be repeated twice at half-hour intervals.

Atropine is an antidote to the poison of the "fly amanita," which paralyzes the nerves controlling the action of the heart. If the "deadly amanita;" which dissolves the blood corpuscles, has been eaten, the atropine will probably do no good, and death will surely follow if the amount eaten is sufficient.

The "deadly amanita," shown in one of its forms in the accompanying illustration (Pl. 55, fig. 2), is a very conspicuous and beautiful object, occurring throughout the summer and autumn in open groves and along the edges of woods. Neither its odor nor its taste is disagreeable, as is the case with most inedible mushrooms, and it must be recognized by a careful study of its form and parts, which are, fortunately, very characteristic.

The most important part of the deadly amanita is the sheath at the base of the stem known as the "death-cup," which is well shown in the illustration. This is what remains of the outer coat of the "egg" after the cap has burst from it and has been carried upward by the growing stem. The ring on the stem is similar to that of the common mushroom, but the gills are white, both when young and old, those of the common mushroom being at first pink, then black. Nothing can be told from the color of the upper surface of the cap because it varies so much, being pure white, yellowish, brownish or blackish. Sometimes the surface is perfectly smooth and at other times it is adorned with pieces of the "death-cup," which were carried up on it when the cap burst through the roof of the "egg."

When gathering mushrooms it is exceedingly important to get all of the stem and not leave a portion of it in the ground, since the "death-cup" may thus be overlooked. Mushrooms should not be gathered in the "button" stage unless mature specimens are growing in the same place, otherwise an "egg" of one of the poisonous kinds may be collected by mistake.

The "fly amanita" is as beautiful as it is dangerous. The cap is usually bright scarlet, yellowish or orange, sometimes fading to nearly white, and covered with conspicuous warts, which are portions of the death-cup carried up from below. The rest of the cup will usually be found in fragments in the soil about the swollen base of the stem. The gills are white and remain so,

thus differing from those of the common mushroom. The warts on the cap also distinguish it. I have not found this species common here, but it is very abundant in many localities, both in this country and in Europe.

The death-cup and its remains on the surface of the cap should always be looked for, and no mushroom of this group should be eaten by the beginner, although some of them are most excellent.

The parasol mushroom is too much like the amanita to be recommended for general use, but careful observers may soon learn to know it accurately. The cap is fawn-colored or brownish, and its surface is broken up into broad, thick scales, which, being a part of the cap, do not separate readily. In the amanita the "scales" are parts of the roof of the death-cup and may be easily removed from the cap. The parasol mushroom also differs from amanita in having a free and movable, instead of a fixed, ring, and in having no cup nor fragments of a cup at the base of the stem, although the base is swollen. This excellent variety grows in thin woods or along the edges of fields. It is one of the best to dry for winter use.

The oyster mushroom, found in dense clusters on decayed logs in woods, can hardly be mistaken for any poisonous kind. It is attached to the log by its side or by a very short stem, and is white throughout, with a slight grayish or brownish tinge. A very nearly related edible species, the sapid pleurotus (Pl. 55, fig. 5), which cannot be distinguished from the oyster mushroom by the amateur, grows especially on elm logs in this vicinity.

The "ink-caps" are abundant and excellent, and it is almost impossible to confuse them with poisonous species on account of the peculiar way they have of melting into a black fluid when mature. The glistening ink-cap grows abundantly about stumps and dead trunks, especially of elm, and appears very early in the season. It grew last year on buried wood under a tree in my yard, the small, light buff caps appearing by the hundreds in dense clusters after rains from April to November. When seen in the early morning, when the plants were crisp and fresh, they glistened as though dusted with powdered mica. Later in the day, the caps expanded and turned black on the under side and

finally went to pieces. They should be gathered young and cooked within a few hours after picking.

The common ink-cap grows in close clusters on lawns, appearing about the same time with the field mushroom. It is much larger than the glistening ink-cap and is gray or smoky above with a few scales on the very top of the cap, and white below, but soon becomes black and melts away.

The "shaggy-mane" is a very striking object when it appears on lawns, being cylindrical in shape, with shaggy, white upper surface and white or pinkish gills, which melt into an inky fluid at maturity. This is the largest and best, but also the rarest, of the ink-caps.

The many-headed clitocybe (Pl. 54, fig. 4) occurs in dense clusters on lawns, especially in rather long grass, and is usually found in great abundance when found at all. Its flesh is very firm, with a slight oily flavor, and it may be kept for several days without deteriorating. It is a valuable species and worth transplanting.

The rough-stemmed boletus (Pl. 54, fig. 5) is a very handsome edible species and the most abundant of the group of fleshy fungi having tubes instead of gills on the under side of the cap. The majority of these are edible, but they are rather difficult to distinguish, and a few species are considered dangerous. The Germans collect many of these edible forms under the name of "steinpilz."

The equestrian tricholoma (Pl. 54, fig. 3), occurring in sandy soil under or near evergreen trees, is too rare in this region to be of importance. The specimens figured were collected in New Jersey.

The honey-colored armillaria, or honey agaric (Pl. 54, fig. 2), occurs in great profusion in the autumn in this locality on and about old stumps and attached to buried roots of both deciduous and evergreen trees, on which it grows as a parasite. It is well known to the Italians, being common also in Europe, and is eagerly collected by them here. I recently saw one in the hemlock grove with over a bushel of the sporophores of this fungus.

The "brick-top," or perplexing hypholoma (Pl. 54, fig. 1),

likewise occurs abundantly in this vicinity until very late in the season, but is confined to the stumps and roots of deciduous trees, appearing in conspicuous reddish clusters of considerable size. Its flavor is not particularly good, but it is useful because of its very late appearance, and it improves puffballs and other species with little flavor when mixed with them.

Puffballs are the safest of all mushrooms for the beginner, none of them being poisonous; and they are at the same time very excellent and very easy to get.

The field puffball (Pl. 55, fig. 1) is found on the lawns and in fields where the common mushroom grows. Very few persons seem to know its excellence. It is often picked when young because of a faint resemblance to the common mushroom in color, and at once thrown away. The accompanying illustration was made from a specimen collected in the fruticetum of the Garden, measuring six inches in diameter, but it is often not larger than a good-sized pear, which it somewhat resembles in shape. The surface is gray and nearly smooth, and the inside milk-white, becoming purple when old and dry. The name puffball is assigned because of the cloud of dust which arises from one of these old dried specimens when stepped upon.

A much smaller kind, about the size of a large marble, is abundant in the same localities where the field puffball occurs (Pl. 55, fig. 7). It is pure white and so abundantly adorned with spines that it appears shaggy. When older, these spines peel away and show the thin, brown inner coat, thus suggesting the name "separating" puffball.

The studded puffball (Pl. 55, fig. 3), found on the ground in woods, is smaller than the field puffball, but is abundant and has a longer season. It is pure white, pear-shaped, and ornamented with spines having bases resembling cut gems. Another kind, slightly darker and smaller but of similar shape, called the pear-shaped puffball, occurs in dense clusters on rotten logs and stumps in woods. I have found this abundant here late in November. The giant puffball, which is rarely smaller than a man's head and sometimes attains the huge size of ten feet in circumference, also occurs in woods, usually near old stumps or in rich leaf-

mould. There is a shallow pit in the hemlock grove in the Botanical Garden where it appears every year; and at Ithaca, New York, there used to be a stretch of low beech woods with a number of old stumps, where one might be sure of finding it when the weather was seasonable. At a distance these giant puffballs looked like a group of smooth white boulders, and a small section of one of them was sufficient for a meal.

Puffballs are good either stewed, or fried in thin slices with butter, but cooked in the latter way they soak up a quantity of butter and are very rich. Being tender they cook quickly and are easily digested. They should as a rule be cut open before cooking to see that they are not too old and that they are really puffballs. If they are white and firm like cream cheese inside, showing no yellow or brownish discoloration, they are of the right age to use. If the interior shows no special structures, but is smooth and of the same color and appearance all the way through, then one may be sure he has a puffball. The "egg" of the amanita contains the young cap and stem inside, which is readily seen when the egg is cut; and the egg of the poisonous stinkhorn (Pl. 55, fig. 6) shows the stem and a green mass inside surrounded by a layer of jelly-like substance.

The hard-skinned puffball, although edible when young, is an exception to the color rule, being almost perfectly black inside. It also differs from most puffballs in having a hard yellowish-brown, warty rind, which must, of course, be peeled off if an attempt is made to use this kind for food. It is commonly found in rather firm soil in dry woods.

The coral mushrooms are easily known by their striking resemblance to clusters of delicately branched coral. They grow on the ground or on rotten wood in dense shade, and are whitish or yellowish in color. Unfortunately, I have not found them abundant about New York. When tender and of mild flavor they make a delicious dish. None of them are poisonous. A near relative of the true coral mushrooms, called Sparassis, was found recently at New Rochelle by Miss Daisy Levy and brought to me for determination. This is a very excellent edible species and cannot be confused with poisonous kinds.

There is still one excellent kind that I must not fail to mention. The "beefsteak" mushroom, common on chestnut and oak stumps, may be readily recognized by its resemblance to a piece of beefsteak. The cap is red and juicy, and is attached by a short lateral stem. When cut open, the inside appears reddish and streaked or mottled like the cut surface of a beet root. The flesh is very firm and keeps for several days. If the acid taste is objectionable, it may be easily corrected by the use of soda while cooking. This mushroom will probably be very abundant about New York in the next few years because of the great number of dead chestnut trees.

In conclusion, my advice to beginners is to confine themselves at first to the common mushroom, the beefsteak mushroom, the puffballs, the coral mushrooms and other readily recognizable forms, being careful to carry with them when collecting an accurate mental picture of the deadly kinds, which have the death-cup or the peculiar patches on the cap, and to avoid mushrooms that are either too young or too old when selecting specimens for the table. If one *must* experiment, let him begin with experiments in cooking, since the way in which a mushroom is cooked often has much to do with its flavor and digestibility.

The photographic work for the accompanying illustrations was done by Mr. F. C. Berte and the color work by Mr. E. C. Volkert.

W. A. MURRILL,
Assistant Director.

EXPLANATION OF PLATES LIV AND LV.

PLATE LIV.

Fig. 1. "Brick-top" or perplexing hypholoma.
Fig. 2. Honey-colored armillaria or honey agaric.
Fig. 3. Equestrian tricholoma.
Fig. 4. Many-headed clitocybe.
Fig. 5. Rough-stemmed boletus.

PLATE LV.

Fig. 1. Field puff-ball.
Fig. 2. "Deadly amanita."
Fig. 3. Studded puff-ball.
Fig. 4. Common field mushroom.
Fig. 5. Sapid pleurotus.
Fig. 6. Poisonous stinkhorn.
Fig. 7. "Separating" puff-ball.

THE MUSEUM COLLECTION OF FOSSIL PLANTS.

THE ORIGINAL COLLECTION. — The nucleus of the museum collection of fossil plants is the material deposited by Columbia University with the Garden under an agreement dated May 3, 1901, in which year it was transferred from the University to the museum building. It consists almost entirely of collections gathered together during a period of some forty years by the late Dr. John Strong Newberry, formerly professor of geology and paleontology at Columbia.

The number of specimens in the collection at the time when the transfer was effected was roughly estimated at about 8,000. Subsequent work, however, in the arrangement of the museum, clearly indicated that this estimate was too low. It also did not include a large number of specimens contained in several boxes which had apparently never been opened. These have recently been unpacked and the specimens arranged with the others in their proper sequence — a piece of work which was impossible of accomplishment until this year, when the six new cases provided for the purpose became available. A somewhat hasty enumeration now indicates that at least 2,000 specimens from this source should be added to the original estimate and that the Columbia University collection may be conservatively credited with not less than 10,000 specimens.

The scientific value of this collection in its entirety, and the historical interest which attaches to a large part of it, cannot be adequately described or discussed within the limited scope of this article; but brief references to the more important facts in connection with certain of the material may serve to at least indicate what the collection as a whole represents.

Among the most interesting specimens, from the historical standpoint, are those collected by Dr. Newberry about 1850, upon which he based his earliest paleobotanical contribution, "Fossil Plants from the Ohio Coal Basin." This paper was read before the Cleveland Academy of Natural Science in 1853, and may be found in the Proceedings, pp. 26–53. This same paper, with additions, was also published as a series of articles, sparsely

illustrated, in the Annals of Science, 1: 95–97; 106–108; 116, 117; 128, 129; 152, 153; 164, 165; 268–270; 280–281. 1853, and 2: 2, 3. 1854. These papers are among the earliest contributions to American paleobotany and the specimens described in them are among the earliest described American fossil plants. Unfortunately, however, many of these are impossible of identification with the descriptions and figures, although for the most part they are designated as to name and locality by printed labels, evidently text cut from the articles in the Annals of Science. The specimens collected by Dr. Newberry may therefore be definitely identified, but it is merely an assumption that those designated by the text labels are the exact ones upon which the names and descriptions were based, except in the case of those which can be identified by means of the figures.

Other important collections, made by Dr. Newberry personally, or made by others and reported upon by him, are such as were obtained during the prosecution of various government explorations, from about 1855–60, viz., the Northwest Boundary Commission, the Pacific Railroad and the Macomb, Ives, and Raynolds expeditions, in what was at that time generally known as "the far West." Just how complete these collections may be can probably never be determined, but they contain a large number of the type specimens described in certain of the published reports of these expeditions and for that reason alone their scientific value can hardly be overestimated.

Subsequently Dr. Newberry was Director of the Ohio Geological Survey and also assisted in the preparation of several paleontological reports for other geological surveys, and further collections of fossil plants were obtained from these sources, the most extensive of which is that from the Cretaceous of New Jersey, upon which he based his "Flora of the Amboy Clays," published in 1896 as Monographs of the United States Geological Survey, Volume XXVI. This latter collection is practically intact and includes not only all of the type and figured specimens described in the Monograph but also a large number of duplicates which serve as valuable material for exchange.

Among the smaller collections may be specially noted those upon which Dr. Newberry based the following contributions:

"Descriptions of Fossil Plants from the Chinese Coal-bearing Rocks, etc." Smithsonian Cont. **15**: 119–123, *pl. 9*. 1867.

"Descriptions of Some Peculiar Screw-like Fossils from the Chemung Rocks." Ann. N. Y. Acad. Sci. **3**: 217–220, *pl. 18*. 1885.

"Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley." Monog. U. S. Geol. Surv. **14**. Washington, 1888.

"Rhaetic Plants from Honduras." Amer. Jour. Sci. **36**: 342–351, *pl. 8*. 1888.

"Devonian Plants from Ohio." Jour. Cincinnati Soc. Nat. Hist. **12**: 48–57, 104, 105, *pls. 4–6*. 1889.

"The Flora of the Great Falls Coal Field, Montana." Amer. Jour. Sci. **41**: 191–201, *pl. 14*. 1891.

A few specimens only are lacking in the above-mentioned collections, and these may possibly be found among the unassorted specimens when these are subjected to final careful scrutiny.

Among the miscellaneous material may be specially noted the extensive collection made in Australia in 1838–42, by the Wilkes Exploring Expedition, containing the type specimens described by Dana in volume 10, Appendix to the Report on the Expedition; two collections of Upper Devonian plants from the celebrated "Fern Ledges" of New Brunswick, made and identified by C. F. Hartt; a suite of specimens from the Tertiary sandstone of Bridgeton, N. J., mostly collected by the late Dr. John I. Northrop, which have been made the subject of a forthcoming Bulletin of the U. S. Geological Survey, by the writer, and numerous lesser collections upon which more or less well-known contributions have been based. Among these latter may be noted the following:

"The Potomac or Younger Mesozoic Flora." Wm. M. Fontaine. Monog. U. S. Geol. Surv. **15**. Washington, 1889. (A small number only of the specimens described.)

"Note on a Collection of Tertiary Fossil Plants from Potosi, Bolivia." N. L. Britton. Trans. Amer. Inst. Min. Eng. **21**: 250–259, *illust.* 1893. (Collection complete.)

"Preliminary Contribution to Our Knowledge of the Cretace-

ous Formation on Long Island and Eastward." Arthur Hollick. Trans. N. Y. Acad. Sci. **12**: *222–237, pls. 5–7.* 1893. (Collection complete.)

"Additions to the Paleobotany of the Cretaceous Formation on Long Island." Arthur Hollick. Bull. Torrey Bot. Club **21**: 49–65, *pls. 174–180.* 1894. (Collection complete.)

"The Cretaceous Clay Marl Exposure at Cliffwood, N. J." Arthur Hollick. Trans. N. Y. Acad. Sci. **16**: 124–136, *pls. 11–14.* 1897. (Collection complete.)

"Notes on Block Island." Arthur Hollick. Ann. N. Y. Acad. Sci. **11**: 55–88, *pls. 2–9.* 1898. (Collection complete.)

"A Report on a Collection of Fossil Plants from Northwestern Louisiana." Arthur Hollick. Geol. Surv. La., Rept. **1899**: 276–288, *pls. 32–48.* 1900. (Collection complete.)

ACCESSIONS BY THE GARDEN. — Accessions have been received from a variety of sources since the original collection was installed, either by the purchase of specially desirable material; by exchange; by donation; or by collections made during the prosecution of field work under the auspices of the garden; and it seems pertinent to here call attention to the fact that these accessions were mostly all obtained from time to time, either for some special purpose in connection with the museum, or through some important investigation or report, and not merely with the object of increasing the size of the museum collection.

By Purchase. — The largest single accession is the collection of Cretaceous plants from the Dakota sandstones of Kansas, purchased from Mr. Charles H. Sternberg. This contains some 1,400 specimens, beautifully preserved and admirably adapted for display purposes. It also includes some of great biological interest, such as an almost perfect petal of a large magnolia flower and two well-preserved fig fruits. Both of these are unique fossils, not elsewhere represented in any museum, so far as known. They may be found described and figured in a paper entitled "A Fossil Petal and a Fossil Fruit from the Cretaceous (Dakota Group) of Kansas" in the Bulletin of the Torrey Botanical Club, **30**: 102–105, *figs. A. B.* 1903.

By Exchange. — Three collections have been added by exchange of specimens. One of European Jurassic and Tertiary plants, from the Natural History Museum of Paris, containing 75 specimens; the others of Tertiary plants from the John Day Valley beds of Oregon, and Cretaceous and Tertiary plants from the Yellowstone National Park, from the U. S. National Museum, consisting of 15 and 50 specimens, respectively.

In exchange for reports on collections submitted for examination to the curator of fossil botany the following accessions are to be noted:

About 500 specimens representing the flora of certain Cretaceous, Tertiary and Quaternary horizons in Maryland, from the Maryland Geological Survey. Two reports on this material have been issued, viz.: "Plantae: Phanerogamia." Md. Geol. Surv., Miocene: 483–486, *figs. 1a–1h.* 1904, and "Systematic Paleontology of the Pleistocene Deposits of Maryland: Pteridophyta and Spermatophyta." *Ibid.* Pliocene and Pleistocene: 217–237, *pls. 67–75.* 1906. All of the type specimens described and figured in these reports are included.

About 200 specimens representing the Cretaceous flora of Long Island and Marthas Vineyard, from the U. S. Geological Survey. These are duplicates, a number of them counterparts of type specimens, forming a part of the material upon which was based "The Cretaceous Flora of Southern New York and New England," issued as Monographs of the United States Geological Survey, Volume L., Washington, 1906. In this instance the Garden could only secure the duplicates, as all type or figured specimens collected through the Survey are by law required to be deposited in the U. S. National Museum.

About 160 specimens of Tertiary plants from Louisiana, not yet reported on, from the Louisiana Geological Survey.

About 25 specimens from the Grand Gulf formation of Alabama, from the Geological Survey of Alabama. Examined and reported upon.

About 20 specimens from the Laramie formation of the Bad Lands, from the American Museum of Natural History. Examined and reported upon.

By Donation. — The following collections have been added through donations:

About 350 specimens from the Cretaceous clay marls of New Jersey, by Mr. E. W. Berry, containing all of the type and figured specimens described in the following contributions:

"The Flora of the Matawan Formation (Crosswick's clays)." Bull. N. Y. Bot. Gard. **3**: 45–103, *pls. 43–57.* 1903.

"New Species of Plants from the Matawan Formation." Amer. Nat. **37**: 677–684, *figs. 1–9.* 1903.

"Additions to the Flora of the Matawan Formation." Bull. Torrey Bot. Club **31**: 67–82, *pls. 1–5.* 1904.

"Additions to the Fossil Flora from Cliffwood, New Jersey." Bull Torrey Bot. Club **32**: 43–48, *pls. 1, 2.* 1905.

About 75 specimens from the Tertiary shales of Florissant, Colorado, by Professor T. D. A. Cockerell. These include several unique and interesting examples of the preservation of delicate plant remains, two of which have been made the subjects of special papers, viz.:

"American Fossil Mosses, with Description of a New Species from Florissant, Colorado." E. G. Britton and Arthur Hollick. Bull. Torrey Bot. Club **34**: 139–142, *pl. 9.* 1907.

"Description of a New Tertiary Fossil Flower from Florissant, Colorado." Arthur Hollick. Torreya **7**: 182–184, *figs. 1, 2.* 1907.

About 50 specimens from the Lower Cretaceous (Great Falls Group) of Montana, by R. S. Williams, including the type of *Zamites Montanensis* Font. (See article in the JOURNAL, **7**: 115. 1906.)

In addition to the above collections there have been several lesser ones donated, probably aggregating about 100 specimens in all.

By Collection. — Through the members of the staff and others interested in the Garden, specimens are constantly being added from collections made in the field. Three of these may be specially mentioned, viz:

About 150 specimens from Long Island and Martha's Vineyard, forming part of the material previously mentioned as the

basis of the U. S. Geological Survey Memoir on " The Cretaceous Flora of Southern New York and New England." A number of the type specimens there decribed and figured are included.

About 50 specimens of fossil leaf impressions, lignites and amber from the Cretaceous clays of Kreischerville, Staten Island, containing the best preserved Cretaceous material for structural study ever discovered. Several preliminary papers dealing with these remains have been issued viz. :

" The Occurrence and Origin of Amber in the Eastern United States." Arthur Hollick. Amer. Nat. **39** : 137–145, *pls. 1–3.* 1905.

" Affinities of Certain Cretaceous Plant Remains Commonly Referred to the Genera *Dammara* and *Brachyphyllum.*" Arthur Hollick and E. C. Jeffrey. Amer. Nat. **40** : 189–216, *pls. 1–5.* 1906.

" On Cretaceous Pityoxyla." E. C. Jeffrey and M. A. Chrysler. Bot. Gaz. **42** : 1–15, *pls. 1, 2.* 1906.

" The Wound Reactions of Brachyphyllum." E. C. Jeffrey. Ann. Bot. **20** : 383–394, *pls. 27, 28.* 1906.

" Araucariopitys, a New Genus of Araucarians." E. C. Jeffrey. Bot. Gaz. **44** : 435–444, *pls. 28–30.* 1907.

" On the Structure of the Leaf in Cretaceous Pines." E. C. Jeffrey. Ann. Bot. **22** : 207–220, *pls. 13, 14.* 1908.

Part of this material has also been utilized in the preparation of a forthcoming Memoir of the Garden, now ready for the press, and the remainder for a subsequent contribution which is planned to be issued as a publication of the U. S. Geological Survey, from which source a grant of $300 was obtained for the prosecution of field and laboratory work.

About 15 specimens of Devonian (Cattskill Group) plants, from Tannersville, Pennsylvania, an horizon which has yielded comparatively few well-defined fossil plants in this region.

Summary of Accessions. — It may thus be seen that the Garden has added to the original collection :

By purchase,	1,400	specimens.
" exchange,	1,045	"
" donation,	575	"
" collection,	215	"
Total,	3,235	

It should also be remarked that the number indicating the number of specimens collected (215) is more or less misleading for the reason that a large part of these consist of finely divided lignitic material, contained in vials or massed in bulk, each so-called specimen, therefore, including many individual specimens.

ARRANGEMENT OF THE COLLECTION. — The general arrangement of the collection is on the basis of geologic sequence, and is designed primarily to indicate the evolution of plant life from its earliest appearance on earth up to the present time. The best preserved specimens, or those which have some special significance or are of value for general educational purposes, are displayed under glass, and the remainder are arranged in the tiers of drawers beneath the floor cases.

There are now twelve floor cases and five wall cases, located in the main basement hall, to the east and west of the central part, and numbered in accordance with the geologic sequence of time and periods, as follows: (See Fig. 38.)

FLOOR CASES.

No. 1 — Paleozoic Time. Cambrian, Ordovician, Silurian, Devonian and early Carboniferous Periods.

Nos. 2–4 — Paleozoic Time. Carboniferous Period.

No. 5 — Mesozoic Time. Triassic and Jurassic Periods.

Nos. 6–8 — Mesozoic Time. Lower Cretaceous Period.

No. 9 — Mesozoic Time. Upper Cretaceous Period.

No. 10 — Neozoic Time. Tertiary Period (Eocene).

No. 11 — Neozoic Time. Tertiary Period (Eocene and Miocene).

No. 12 — Neozoic Time. Tertiary (Miocene), Quaternary and Modern Periods.

WALL CASES.

No. 1 — Paleozoic Time. Cambrian, Ordovician, Silurian and Devonian Periods.

Nos. 2–4 — Paleozoic Time. Carboniferous Period.

No. 5 — Neozoic Time. Tertiary and Quaternary Periods.

A fair idea of the sequence of plant life in the history of the earth may therefore be obtained by observing the specimens in their sequence in accordance with the numbering of the cases, as indicated in Fig. 38. This, as previously stated, is a geological arrangement, but incidentally it is also roughly biological and follows the same system as that on which the museum of systematic botany is arranged, inasmuch as the plants of the earlier periods are low in the scale of life and those of the later

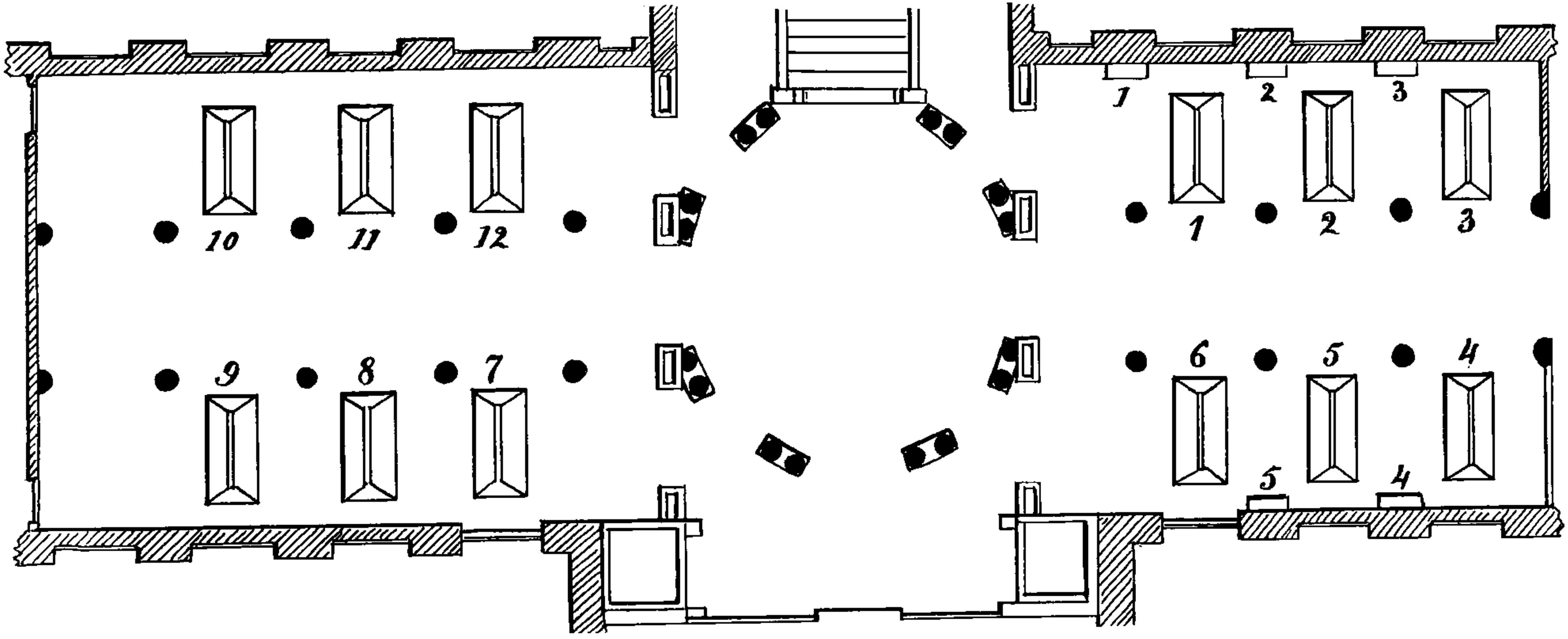


FIG. 38. Diagram of east and west wings of main basement floor, showing arrangement of the cases containing the paleobotanical collection.

periods include a constantly increasing number of the higher forms. Thus, for example, in the cases representing Paleozoic time the plants are all thallophytes or seaweeds, pteridophytes or ferns and their allies, cycado-filices or cycad-ferns, and a few conifers. In the first case representing Mesozic time, containing the plants of the Triassic and Jurassic periods, the majority consists of gymnosperms, both cycads and conifers, while in the next succeeding Mesozoic cases, containing the Lower and Upper Cretaceous plants, nearly all are angiosperms, many of them included in genera now in existence. The cases representing Neozoic time contain a constantly increasing number of living genera of angiosperms, until finally, in the last case, may be seen the remains of Quaternary plants which are indentical, both generically and specifically, with our living flora.

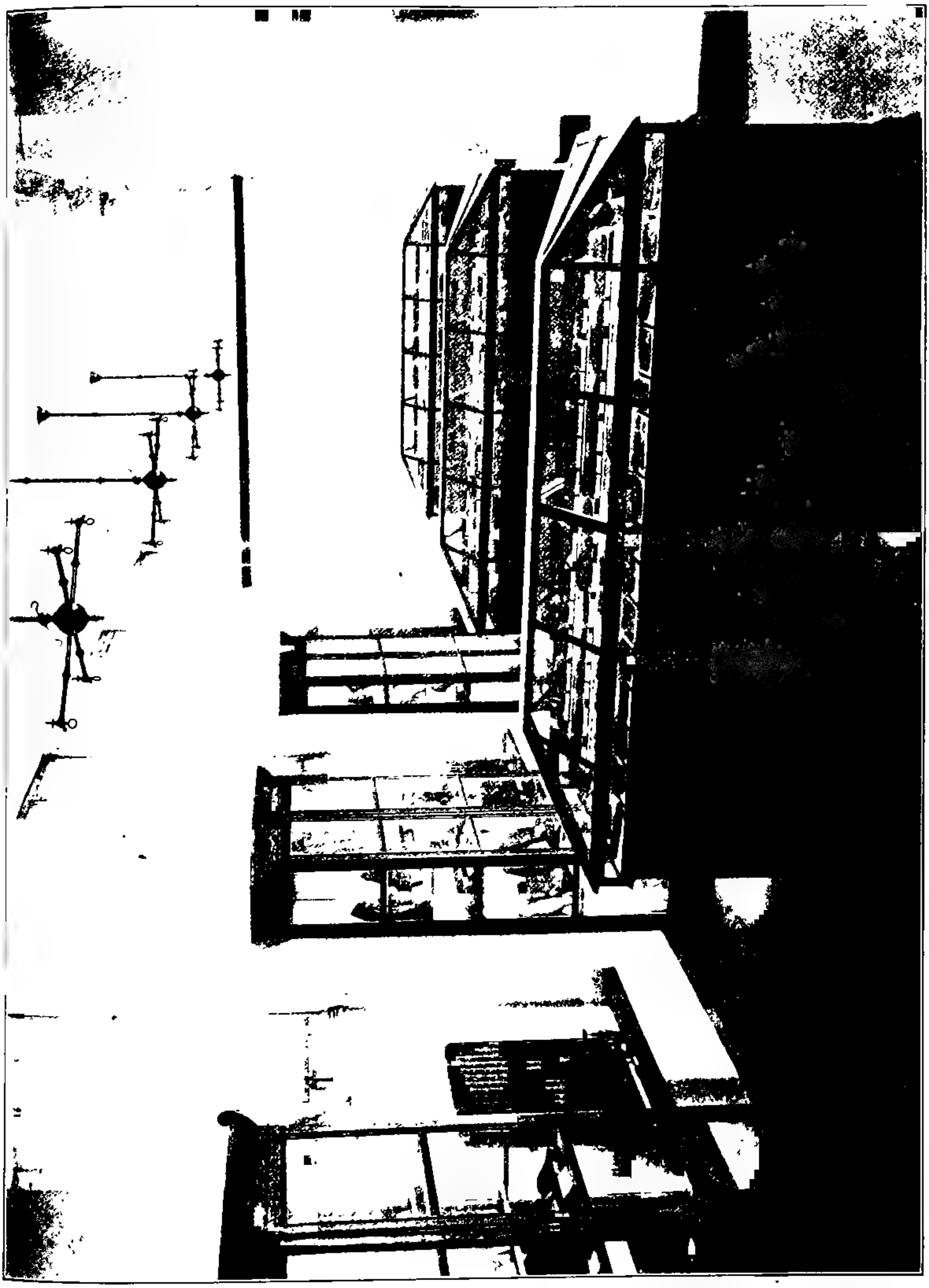
Coincident with this general arrangement, which illustrates the evolution of the vegetable kingdom as a whole, each case contains some individual specimens, or groups of specimens, which illustrate certain features or indicate certain phases of the subject, which are of interest to students in special lines of investigation. For example, most of the problematic fossils, those which have been classed by some authorities as the remains of plants and by others as traces of animals or as inorganic markings, may be seen in floor and wall cases No. 1 ; namely, *Plumulina*, which is probably a hydroid ; *Phytopsis*, which may be a coral ; *Scolithus*, almost certainly caused by worm burrows ; *Dendrophycus*, which may represent current markings ; *Dictyolites*, which is most likely due to sun cracks, etc. These, and others under the genera *Paleophycus*, *Fucoides*, *Arthophycus*, *Archaeophyton*, etc., have all been and some still are subjects of controversy as to their origin or relationships. In floor case No. 2 and floor and wall cases No. 3, are most of the fern-like plants, all of which were formerly thought to be true ferns, but many of which are now known, from critical study of the remains, to belong to an extinct order, Cycadofilicales, which had the outward appearance of ferns with fructification similar to that of the cycads or sago palms. Representatives of the interesting "*Glossopteris* flora" may be found in floor case No. 5, — a flora of uncertain botanical relationship

which flourished in the transition period between Paleozic and Mesozoic Time, particularly in the southern hemisphere, and may yet have its living prototype in the South African genus *Stangeria*, a cycad having leaves with pinnately arranged forking veins, similar to ferns. Fossil plants found within the limits of the City of New York, on Staten Island, or in the immediate vicinity, in New Jersey and on Long Island, are displayed in floor cases Nos. 6 and 7. Methods of preservation, either by petrification, incrustation or carbonization, are shown by numerous specimens of silicified wood, remains of various kinds from the vicinity of calcareous or silicious springs, and from Quaternary and recent swamp deposits, in wall case No. 5, and in floor cases Nos. 11 and 12. A large part of the material in floor case No. 12 is designed especially to indicate how our living flora is being preserved in our peat bogs and other swamp and pond deposits and gradually converted into lignite, by the slow process of natural distillation.

A view of the north side of the east wing of the museum hall, containing floor and wall cases Nos. 1–3, is shown in Fig. 39.

FACILITIES FOR CRITICAL STUDY AND RESEARCH. — While the main object of the museum arrangement is to enable the casual visitor to obtain a general idea of the significance of the collection and the salient features which it represents, it is also well adapted for critical study and research. The plants of any given horizon or period may be found in their proper stratigraphic position in the cases, in accordance with the general arrangement of the museum, and the specimens from each locality, or those collected by any expedition at any one time from an extensive area or region are grouped together, and whenever possible a duplicate copy of the paper in which the specimens are described is deposited with them for ready reference. Type specimens are designated by red stars and others which have been the subjects of illustrations are indicated by blue triangles.

The library of fossil botany, which has been developed in connection with the collection, is now second only to that of the U. S. National Museum. Cordial relations have been established with practically every paleobotanist in the world, with the result



that nearly all important works or papers on paleobotany come to the library as soon as published.

Every year students and investigators in paleobotany have availed themselves of the opportunities and advantages which the Garden supplies in this line of work, which are believed to be unequalled by any other institution in America, and which could be still further enlarged by including within their scope equipment for morphological as well as systematic work.

ARTHUR HOLLICK.
Curator.

ENRICHING SOIL BY CRIMSON CLOVER.

The value of clovers and other leguminous plants in the fertilization of soils has long been recognized but it is only within comparatively recent years that the reasons for this have been thoroughly studied.

Nitrogen which is contained in the soil in the form of compounds is necessary to the life of the plant, and although free nitrogen is present in the air in great abundance it is not available to the average plant in this form. When the nitrogen compounds become exhausted from the soil by constant use it becomes necessary to restore these through fertilizers. Although free nitrogen is not available by the average plant it has been found that certain bacteria which are known as nitrifying bacteria are able to use the free nitrogen from the air and to fix it in the form of compounds in which form it is available by other plants. These bacteria do not act alone but live as parasites on the roots of clovers and related plants where they form swellings known as nodules. Although parasites, they give in return for the sustenance which they draw from the plant on which they grow, the nitrogen so necessary to that plant. Through this adaptation leguminous plants are able to grow in soils which contain a very small amount of nitrogen compounds and to restore to the soil through their remains these compounds in sufficient quantity to supply the needs of other forms of vegetation. By the growth and the subsequent plowing under of leguminous crops it has

been found that worn out soils may be fertilized at much lower cost than by other artificial means.

As noted in the JOURNAL for June an area of about half an acre of land at the rear of the museum building was graded and prepared for sowing crimson clover seed in April and May. The area was one that had to be denuded in the general grading operations around the building and a great deal of rock taken out of it, and it was subsequently covered to an average depth of about 10 inches with top-soil hauled from other parts of the grounds, affording excellent opportunity for the use of crimson clover instead of manure for fertilizing. The record of growth is as follows:

May 14, seed sown and the ground rolled.

May 20, first appearance of seed-leaves above ground.

May 30, first simple foliage leaves abundant.

June 2, tubercles on main roots nearly 1 mm. in diameter; minute tubercles on secondary roots.

June 15, plants about 2 inches high; increase in tubercles on the root system.

July 1, crop averaging 6 inches high, with proportionate increase of tubercles on the root system.

The continued and severe drought through June and July greatly retarded growth, so that not more than about one third of the full crop was obtained. A small proportion of the plants came into bloom late in July.

August 7, the crop was plowed in.

September 9, area sown with lawn mixture.

December 1, area well covered with young grass.

EXPENDITURES IN MAY.

Plowing, team and 2 men, one day	$7.00
Harrowing and rolling, team and 1 man, $\frac{1}{4}$ day	1.25
Sowing, 1 man, $\frac{1}{5}$ day	.40
Cost of crimson clover seed	.72

EXPENDITURES IN AUGUST.

Plowing, team and 2 men, $\frac{3}{4}$ day	5.25

EXPENDITURES IN SEPTEMBER.

Cost of lawn grass seed	2.00
Harrowing, sowing and rolling	4.50
Total expenses for half an acre	$21.12

The cost of thus enriching a large acreage would, of course, be considerably less, probably not more than $30 per acre.

N. L. BRITTON.

NOTES, NEWS AND COMMENT.

Volume 22, part 4, of North American Flora, containing descriptions of the family Rosaceae (pars), by P. A. Rydberg, was issued November 20, 1908.

Dr. and Mrs. W. A. Murrill sailed for Jamaica December 5, to study and collect fungi at various points on the island.

A plant of *Acacia platyptera* has just come into flower at the conservatories. The flowers are bright yellow and are borne on what appear to be stiff, flat leaves, but these are really branches. The plant has no true leaves, and these leaf-like branches take the place of leaves in the economy of the plant. This acacia is native in Australia, and is now in house No. 12.

The collection of orchids in house No. 15 has been of great interest for some time back, and promises to continue this interest for some weeks to come. *Dendrobium Coelogyne*, with the habit of a Coelogyne but the flower structure of a Dendrobium, has been in flower for several weeks, and is still in bloom. This is a most peculiar plant, and this is the first time it has flowered with us. Some showy oncidiums, including *O. altissimum*, will be a mass of yellow during December. The large collection of Venus-slippers, representing the genera *Paphiopedilum* and *Phragmipedium*, forming a part of the large collection of orchids presented to the Garden by Mr. Oakes Ames last year, has been attracting much attention for some time past, and the buds in sight now give promise of an interesting exhibit during December. There are in this collection a large number of hybrids, some of them of extreme beauty and attractiveness. A view of these plants would well repay any visitor to the collections.

Through the generosity of Mr. Henry Hicks, Cornell University will be enabled to establish an arboretum of about twenty acres on a tract of land recently bought from the late F. C. Cornell, adjoin-

ing the campus on the east and the new athletic field on the south. This tract lies along the sides of the Cascadilla ravine and presents a variety of soil and exposure admirably adapted for grouping trees according to their natural affinities. No attempt will be made at landcsape gardening; the contour of the ground will be left as it is, and various groups of trees will be arranged in lanes running northward and southward across this ravine. Mr. Hicks' gift will include many foreign species, notably certain hardy kinds from Japan and Manchuria.

Meteorology for November.— Total precipitation for November .42 inch. Maximum temperatures were recorded of 64.7° on the 3d, 60.3° on the 9th, 57.3° on the 20th, and 59° on the 26th and 27th; also minimum temperatures of 31.7° on the 2d, 25° on the 5th, 24° on the 16th, 25.7° on the 21st, and 34° on the 29th. The mean temperature for the month was 44.35°.

While the amount of precipitation in the form of rain was very low for the month this was in part counterbalanced by fogs and mists which kept the air saturated and prevented excessive evaporation. Heavy fogs from the 23d to the 26th kept the surface of the soil thorougly moist. This followed by very light showers but heavy mists.

ACCESSIONS.

LIBRARY ACCESSIONS FROM NOVEMBER 1 TO NOVEMBER 30, 1908.

AMES, OAKES. *Orchidaceae:* illustrations and studies of the family Orchidaceae. Fascicle III. Boston, 1908. (Given by Dr. N. L. Britton.)

ATKINSON, GEORGE FRANCIS. *Studies of American fungi.* Ed. 2. New York, 1903.

EDWARDS, SYDENHAM. *The new flora Britannica.* London, 1812.

GEIGER, PHILIPP LORENZ. *Pharmaceutische Botanik.* Zweite Auflage, neu bearbeitet von T. F. L. Nees von Esenbeck und J. H. Dierbach. Heidelberg, 1839–40. 2 vols.

LINDLEY, JOHN, & MOORE, THOMAS. *Treasury of botany.* New edition. London, 1870. 2 vols.

LOCKE, JOHN. *Outlines of botany.* Boston, 1819.

MÜLLER, GUSTAV. *Mikroskopisches und physiologisches Praktikum der Botanik für Lehrer.* Zweiter Teil: Kryptogamen. Leipzig, 1908.

NUTTALL, THOMAS. *An introduction to systematic and physiological botany.* Ed. 2. Cambridge, 1830.

PATTERSON, HOMER L. *College and school directory of the United States and Canada.* Chicago, 1908.

ROBINSON, BENJAMIN LINCOLN, & FERNALD, MERRITT LYNDON. *Gray's new manual of botany.* Seventh edition. New York, 1908. (Given by Dr. W. A. Murrill.)

SCHWEINITZ, LEWIS DAVID VON. *Synopsis fungorum in America boreali media degentium.* Philadelphia. 1832. (Given by Dr. W. C. Deming.)

Science-Gossip. Edited by M. C. Cooke & J. E. Taylor. London, 1866–77. 12 vols.

THONNER, FRANZ. *Die Blütenpflanzen Afrikas.* Berlin, 1908.

WARBURG, OTTO, & VAN SOMEREN BRAND, J. E. *Kulturpflanzen der Weltwirtschaft.* Leipzig (1908).

WILLIAMS, J. R. *Suggestions for school gardens.* Jamaica, 1908. (Given by Dr. N. L. Britton.)

MUSEUMS AND HERBARIUM.

77 specimens of hepatics from the Franconia Mountains, New Hampshire. (Given by Miss Annie Lorenz, for a committee of the Sullivant Moss Chapter.)

3 specimens of mosses collected on the Alaskan Mammoth Expedition of 1908. (Given by the American Museum of Natural History.)

1 museum specimen of *Neomeris* from Singapore. (Given by Mr. A. H. Church.)

6 specimens of the leaves of *Sassafras Sassafras.* (Given by Mr. Edwin W. Humphreys.)

4 specimens of mosses from New Hampshire. (Given by Miss Annie Lorenz.)

4 fossil specimens of *Picea canadensis.* (Given by Dr. Arthur Hollick.)

13 specimens of various fossil plants from Colorado and New York. (Given by Mr. Edwin W. Humphreys.)

11 specimens "Hepaticae Norvegici." (From the herbarium of N. Bryhn.)

5 specimens of marine algae from the Dutch East Indies. (By exchange with Mrs. A. Weber-van Bosse.)

22 specimens "Musci Canariensia." (From the herbarium of N. Bryhn.)

1 specimen of fungus from Santiago de las Vegas, Cuba. (By exchange with Mr. H. Hasselbring.)

200 specimens of Canadian mosses. (Distributed by Mr. John Macoun.)

1 specimen of *Neomeris* from the Friendly Islands. (Given by Trinity College, Dublin.)

1 model of the morel. (Given by Dr. W. C. Deming.)

1 specimen of fungus from Lancaster County, Pennsylvania. (Given by Dr. J. K. Small.)

5 specimens of resupinate polypores from Lincoln, Nebraska. (Given by Mr. R. J. Pool.)

2 specimens of *Boletus granulatus* from Biltmore, North Carolina. (Given by Dr. H. D. House.)

5 specimens of polypores from Flat Rock, North Carolina. (Given by Mr. E. R. Memminger.)

52 specimens of marine algae from Pacific Island and Australia. (By exchange with Maj. Th. Reinbold.)

SEEDS AND PLANTS.

5 palms for conservatories. (Given by Hon. W. G. Choate.)

2 plants of *Phyllocactus* for conservatories. (Given by Mrs. M. Mott.)

1 fern for conservatories. (Given by Mr. C. Lanier.)

1 plant of *Paphiopedilum Fairieanum* for conservatories. (By exchange with Mr. J. A. Manda.)

3 plants of *Stylophyllum* for conservatories. (Given by Miss E. M. Wickes.)

3 plants of *Aralia* for conservatories. (By exchange with the Department of Parks, Borough of the Bronx.)

5 grafted cacti for conservatories. (Given by Mr. Henry Schmidt.)

529 plants for the woody collections. (Purchased.)

3 packets of choice *Althaea* seed. (Given by Miss W. A. Compton.)

14 packets of *Crataegus* seed. (By exchange with Mr. B. F. Bush.)

19 plants derived from seed from various sources.

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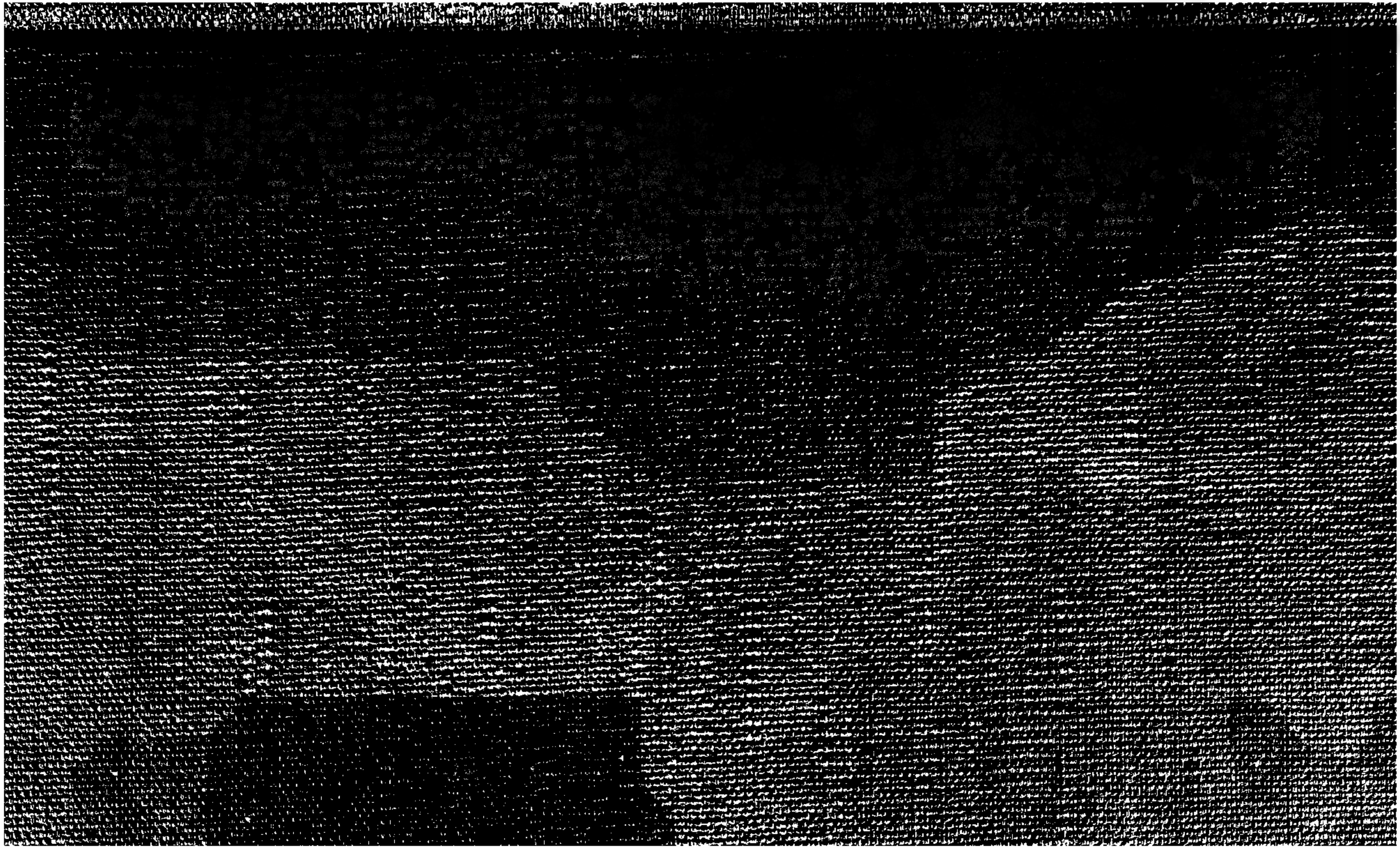

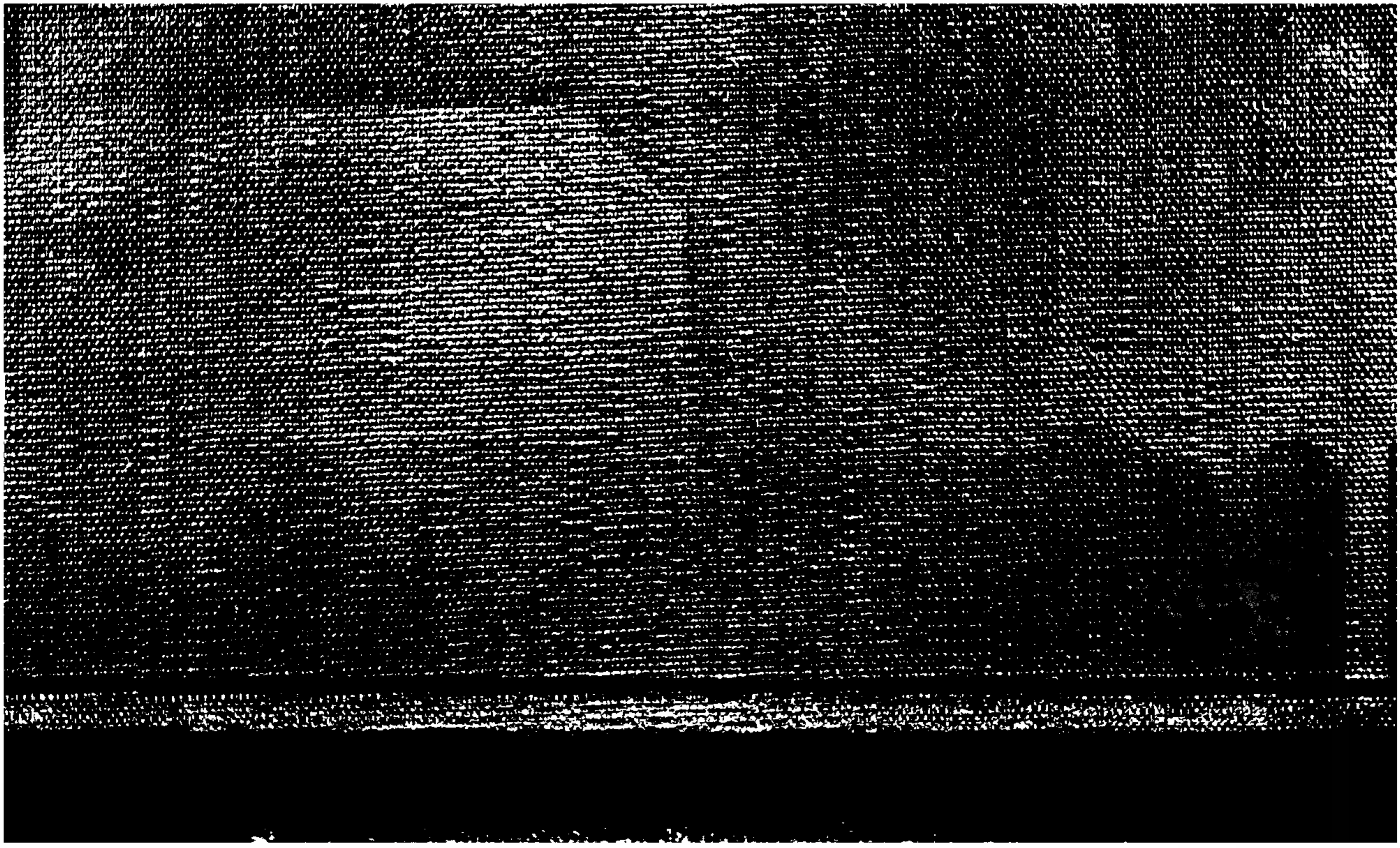

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EDITOR

PERCY WILSON

Administrative Assistant

VOLUME X

WITH 19 PLATES AND 37 FIGURES

1909

PUBLISHED FOR THE GARDEN

AT 41 NORTH QUEEN STREET, LANCASTER, PA

BY THE NEW ERA PRINTING COMPANY

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EDITOR

PERCY WILSON

Administrative Assistant

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ENCLOSING THE GARDEN.

Other than cheap and simple wire fences and rubble-stone walls, scarcely any work has been done toward the permanent fencing of any of the boundaries of the Garden until this year; the need of permanent barriers has been keenly felt, however, in order to reduce vandalism and the theft of plants, and plans for fences have been carefully considered by the Board of Managers. By means of a city appropriation for construction and improvement of the grounds, it became possible early this year to award a contract through the Department of Parks for the complete construction of a permanent fence on the southwestern boundary, adjoining the land of Fordham University, from the terminal Bronx Park Station of the Elevated Railway, easterly to the Southern Boulevard Entrance, a distance of about 2,000 feet. This contract was awarded to Galardi and Guidone, the lowest bidders, for $16,000, being about $8 a running foot, the limit set by the Executive Committee of the Board of Managers when approving plans for the fence, drawn by Mr. John R. Brinley, landscape engineer of the Garden.

The structure, completed in September, has, for most of the distance, a rubble-stone base averaging about two feet in height, on a three foot stone foundation, surmounted by an iron fence about seven feet high which is broken into bays by square piers of gneiss with granite caps, the rubble-stone base being capped with the same granite; along the approach to the Elevated Railway Station the stone base was dispensed with and the wall of

this approach here formed a part of the fence. The character of the fence is well shown by the accompanying reproduction of a photograph (Plate 56) taken early in November, before the planting of shrubs in the strip of land between the path and the fence; it is an elegant, simple and substantial barrier, and will require only painting at intervals of about three years and occasional pointing of the masonry for its ordinary maintenance. At the request of the president of Fordham University a gate six feet wide was provided for the use of students near the Elevated Railway station.

The fencing of the western boundary of the Garden along the right of way of the New York Central and Hudson River Railway Company, from the terminal Bronx Park station of the Elevated Railway northward, a distance of about 3,900 feet, to the northern boundary near Williamsbridge, has long been under consideration by the Executive Committee of the Board of Managers, by officials of the railroad company and by the Commissioner of Parks of the Borough of the Bronx. The problem has been complicated by the telegraph and telephone poles and wires of the railroad company and the Western Union Telegraph Company standing along this line, some of the poles having been located on land of the Garden and others on land of the railroad company. It became apparent during the inquiry that the poles standing on Garden land had been set there without authority some years before the Garden was established, and also that the right of way of the railroad was too narrow to allow of their removal, at all events without completely modifying the railroad structure and roadbed for a long distance. From the standpoint of the Garden these poles and wires are distinctly detrimental, not only from an aesthetic consideration, but because the wires are interfering with planted trees of the border screens. Meanwhile the necessity for a barrier fence has been becoming more urgent, on the Garden side by the increase of depredations and the making of trails across lawns, and on the railroad side by reason of the electrification construction, and the consequent danger to trespassers from live wires.

A solution of the problem satisfactory to all concerned has

recently been made possible, by the approval of the Board of Managers, the Commissioner of Parks and the railroad company of detailed plans, which contemplate the removal of all poles and wires along this western boundary, the wires to be laid in an underground conduit, the top of which shall be at least three feet below the surface of the ground, partly on Garden land and partly on railroad land, and a substantial iron fence with concrete piers, deemed good enough for its location, to be built along the entire boundary, except where it is rendered unnecessary by the masonry driveway approaches at the Bedford Park Boulevard, the Mosholu Parkway and the Woodlawn Road, and by the Botanical Garden railway station. All this work is to be carried out by the railroad company without cost to the city or to the Garden; the plans provide that the railroad company shall be permitted to set the fence back two feet on Garden land for a distance of about 600 feet where the railroad's right of way is narrow; the necessary authority for this is to be requested from the Sinking Fund Commission of the city.

The southern boundary of the Garden reservation, adjoining land of Bronx Park west of the Bronx River, from the Southern Boulevard Entrance eastwardly through the woods to the Bronx Park Entrance has been fenced with red cedar posts and logs cut from dead or unsightly trees and saved for fencing purposes. This low rustic fence serves to indicate the southern boundary through the woodland; most of it was built during September of this year, a small part, south of the Herbaceous Garden, was constructed a few years ago; it is a protection to the Hemlock Grove and other woodlands, and may readily be carried through eastwardly to the Bronx River, which in itself, without any construction, forms a good barrier boundary north from this point to the bend above the water-fall at the Lorillard Mansion.

As to the northern and eastern boundaries of the Garden, it will not be practicable to permanently fence these before the boundary streets contemplated by the plan of the city are constructed, certainly not for several years.

N. L. Britton.

THE RUBBER PLANTS OF MEXICO.*

Until within a few years, there was but a single known source of commercial rubber in the entire republic of Mexico. Now two species are contributing regular supplies, and a third, to be specially considered here, is likely soon to become a very important factor in this industry. Mexico thus becomes one of the most important of the world's rubber-producing countries.

That other sources remain to be developed is very certain, since the families Euphorbiaceae, Moraceae and Apocynaceae, which comprise most of the rubber-yielding plants, are abundantly represented in the Mexican flora. The same may be said of the Sapotaceae, the family that yields gutta percha, chicle and balata.

An accurate understanding of the Mexican rubber plants requires a consideration of the general climatic divisions of the country. Although approximately half of the republic lies within the tropics, geographically, this statement cannot be understood in a climatic sense, because most of this region is so high and dry that its productions range from subtropical to temperate. The climatically tropical region is confined to the extreme southern portion and strips of low land upon the Pacific and Gulf coasts. Over much of the southern part, where the elevation exceeds 3,000 feet, the climate can hardly be described as tropical, while even the lower portions, being exposed to strong sea-breezes, do not experience the torrid heat known to inland tropics. This region is abundantly supplied with rain. Although the rainy season extends only from June to November, yet the remaining months are by no means dry, there being normally an abundance of rain at all seasons. The temperature rarely falls below 70° or rises above 100°, some of the valleys about Vera Cruz being an exception, due to their peculiar location.

In this region grows the *Castilla elastica,* the Central American rubber tree, known also as the Mexican rubber tree or "hule," in all but recent literature. So abundant is this tree

* Abstract of a lecture delivered at the New York Botanical Garden, November 21, 1908.

in one locality, that it and its railroad station, are known as El Hule. This tree also yields rubber in the West Indian Islands. It is a near relative of the *Ficus,* yielding the East Indian rubber, to which its product bears considerable resemblance. On the other hand, it is not related to the *Hevea,* which yields the superior Para or Amazon rubber. The *Castilla* becomes a large tree, some authors state up to six feet in diameter, and lives to a great age. Owing to the destructive methods of collecting its latex, the exportation of Mexican rubber declined from $160,000 in 1882–3 to $47,000 ten years later, and the government was faced with an almost certainty of the practical extermination of the tree. It therefore not only established rules for the method of collection, but offered a handsome subsidy for the planting of the trees. This is one of the most satisfactory of rubber trees for cultivation. It grows well up to an altitude of 1,500 feet and requires a well-distributed rainfall of at least 100 inches, and good drainage. The seeds must be planted very soon after collection, as they do not long retain their vitality. At one year old the tree is about three feet high, and collection can commence when it is from five to seven years of age. Although a number of trees can often be found in proximity, the species can by no means be classed as gregarious. The milk, after collection, must be coagulated artificially. This is mostly accomplished by boiling in water, which causes the rubber to separate as a superficial crust, which is dried and hardened by rolling. The same result is sometimes obtained by merely mixing the milk with water and allowing it to stand. Sea water acts much better than fresh water. Sometimes the coagulation is accomplished by means of adding citric or sulphuric acid. The yield of rubber is nearly one half of the weight of the latex, and the rubber is of only medium quality.

The second variety of rubber to be considered is produced in a region where all the conditions are opposed to those of the *Castilla* region, namely, the high and dry table-land of the northwestern district. Owing to the high degree of radiation, this region is subject to great variation of temperature by day and night, respectively, yet it can be regarded as a hot district. Dur-

ing midday the heat is often extreme. It is excessively dry, the amount of rainfall, even in the short rainy season, being but moderate. Except for some large yuccas, and a few leafless species, trees are almost wanting, and the shrubs are mostly low and stunted. Characteristic shrubby species are *Covillea, Ephedra, Fouquieria,* several species of *Atriplex* and *Artemisia,* or so-called sage-bush, and many Cactaceae. Among these shrubs occurs one, namely, *Parthenium argentatum,* which is an important rubber-yielder, and therefore called "guayule," the Indian equivalent for "wild rubber." It is a low shrub of some two or three feet in height, of robust and densely branching habit, and somewhat gregarious. The stem is rarely so thick as the wrist, and branches from the base, the branches being rather short and stout. This shrub is of very slow growth, requiring probably forty or fifty years to reach its full size. It is as yet too little known to enable us to say how many years it must grow before it will yield sufficient rubber to be worth harvesting, but this is believed to require fifteen years or more. Little is known about its natural methods of reproduction, but it appears to propagate sparingly, in the desert, from seeds. The prospects for a new crop of rubber within a human generation, when all the shrubs of a district have been uprooted, are therefore very poor. Advantage has been taken of this peculiarity by those engaged in exploiting it, to bring about a monopoly. Having purchased all the most important guayule lands, they offered to purchase the shrubs collected from the outlying districts. The price, at first $10 per ton, has been advanced to $130, a price so high as to tempt the collectors to uproot it, a process which is certain to exterminate it except on the company's own lands.

When it was first suggested that rubber could be obtained from this shrub, a member of the daisy family, the greatest incredulity was encountered, and the enlisting of capital in the enterprise was a matter of extreme difficulty. At present, the total capitalization of the interests engaged in this enterprise is said to be about $130,000,000, and there is every prospect that even on this great scale, the business will be very profitable.

The collection of this variety is by a method unknown else-

where in the rubber industry. By it the entire woody portion of the plant is finely ground, and the rubber extracted by liquids from the dust.

This plant has been made the subject of exhaustive study by Professor Francis E. Lloyd, and we hope to have him present the subject to us soon, in an illustrated lecture.

The third, and what we may call the new variety of Mexican rubber, is also unique as to its character, and the methods employed in preparing it. It is produced by the *Euphorbia elastica,* and is therefore a near relative of the Para rubber.

This tree inhabits a region intermediate in location and climatic character between those producing the two previously described varieties, namely, the hilly country where the western edge of the table-land breaks down into the coast slope, at an altitude mostly of from 5,000 to 7,000 feet. The climate of this region might be called subtropical. The banana and the orange grow here, but only exceptionally produce fruit. Some poor apples are grown and corn is the staple agricultural product. Although there is a long dry season, the rainy season is long enough, and its rains abundant enough, to produce the crops without irrigation, for the most part.

This *Euphorbia* will not grow on the alluvial plains, but only on the rough rocky hillsides, where the drainage is good. Its arborescent associates are Randias, Acacias, Convolvuli and a number of Cactaceae. It is a gregarious species, the branches often interarching over considerable areas, although many smaller trees and shrubs are intermingled. It is a rather small tree, the trunks usually less than two feet in diameter, and the height usually under fifty feet. Its branches and branchlets are rather few and massive, there being a dearth of fine twigs. It is therefore not very leafy and does not afford much shade. The leaves are mostly crowded at the ends of the branchlets, and are oblong, thick and smooth, and about six inches in length by one to one and a half in breadth. The bark is thick and rather succulent, at first smooth and of a light or yellowish green color. That of the trunk and large branches soon exfoliates in large, very thin, papery, translucent sheets of an orange-yellow or orange-red

color, which impart a shaggy appearance, and a color that has given the tree its vernacular name "palo amarillo," or yellow trunk, which becomes also the commercial name of this variety of rubber. The flowers appear in January, or there-about, before the appearance of the new leaves, and the fruits mature in June and July. The seeds, which are much like those of the castor-oil, contain about 50 per cent. of a fatty oil, which can be pressed out, and is good for soap-making.

As soon as the bark is wounded, a milky juice exudes, which is very irritant, and capable of producing violent inflammation of the eyes, if it enters them, as it is quite liable to do in spattering, when the tree is cut. A part of this latex soon coagulates, but the coagulum is soft and curdy, rather than tough and elastic, like that of most rubber milks. Rather more than half of it does not coagulate at all, except as a result of drying out. The coagulated portion contains the rubber, about ten per cent. of the entire weight, but with it there is more than twice as much resin. It is this intimate mixture of resin with the rubber that compels a resort to different processes for the manufacture of this rubber from those which apply elsewhere in the rubber industry. The separation has to be effected by solvents, and by the aid of special machinery. Nevertheless, the cost is inconsiderable, and the business bids fair to be very profitable.

The great value of this tree as a rubber-producer lies in its abundance over large areas, and the proximity of the trees to one another, facilitating collection of the milk, as well as the ease with which it can be propagated, and the rapidity of its growth. All that is necessary for propagation is to thrust the newly cut branches into the soil, where they practically all grow. From them the tree reaches its full size in from five to seven years. These considerations appear to justify the opinion that if all other sources of rubber were to fail, this one could probably supply the world's entire requirements.

It may be added that this and several similar species form a peculiar division of the genus which will in all probability be elevated to generic rank. It is said that one known as the "palo colorado," or red trunk, growing in the northern part of

the palo amarillo region, and mingled with the latter species, is probably another member of this group.

The properties of the palo amarillo rubber are peculiar. Taken by itself it is of only medium quality, but mixed in suitable proportion with other varieties, especially with Para rubber, it markedly improves them.

H. H. RUSBY.

CONFERENCE OF THE SCIENTIFIC STAFF AND STUDENTS, DECEMBER 2, 1908.*

The botanical conference of the New York Botanical Garden met on December 2. Dr. W. A. Murrill in a few opening remarks called attention to two species of stinkhorn fungus common in this locality, plants so-named on account of the carrion-like odor which serves to attract insects thus bringing about the distribution of the spores. The egg-like structures from which these plants are produced and which are considered poisonous, from their close resemblance are likely to be mistaken for some of the common, edible puffballs. Photographs were shown to illustrate this similarity in general appearance as well as the various stages in the development of the stinkhorn. So closely does the odor of these plants resemble that of decaying flesh that long searches are often made about dooryards, by those unfamiliar with these facts, for the remains of decaying animals, when it is finally found that the disturbance is caused by one of these, comparatively innocent, plants growing on the lawn. In this connection, Dr. N. L. Britton showed a specimen of *Clathrus* collected in Jamaica, another type of fungus characterized by the odor so offensive to man but so attractive to insects.

Dr. Arthur Hollick exhibited a number of fossil plants from Florissant, Colorado, one of the best known localities for fossil plants in America. Here the deposits, which consist of thinly bedded shales, deposited evidently under quiet conditions, offer

* Meetings of the staff and students of the Garden are held at intervals for the discussion of investigations in progress; abstracts of the proceedings of these conferences will hereafter be recorded in the JOURNAL.

unusually favorable conditions for the preservation of very delicate structures, such as insects, petals of flowers and similar structures which are entirely destroyed under ordinary conditions of sedimentation. A number of specimens collected in this locality by Professor Cockerell have been submitted to the Garden for critical study. From the material already examined, three new species have been described and the types preserved in the museum of this institution. Of these, one specimen of moss represents the first record, for America, of a fossil moss in fruit. Mention was also made of fossil plants collected in connection with mammoth remains at Elephant Point, Alaska, received from the American Museum of Natural History. Among these are several specimens of mosses identical with living species occurring in northern regions. Specimens of wood from a fossil beaver dam at this place were also shown.

Mr. B. C. Gruenberg spoke of some of the problems connected with the study of mycorhiza, delicate fungous threads associated with the roots of many of the higher plants. The existence of such structures has long been known and many theories have been advanced to explain their origin and the relation existing between them and the host on which they occur. The most commonly accepted view at the present time is that of the symbiotic or mutual relationship existing between the two organisms. The fungous filaments are thought to be beneficial to the host in several ways, such as the disintegration of soils and absorption of water, thus functioning as root hairs, these benefits being rendered in return for those offered by the host to the parasite.

It has been thought that plants in which mycorhiza are normally present cannot live without them but this has been proved to be untrue in case of plants with the green coloring matter, chlorophyl. Mr. Gruenberg is making a special study of mycorhiza in certain of the orchids.

Miss Mary P. Anderson read a very interesting paper on the organization of nature study in the public schools, which paper will be published entire in a later number of the JOURNAL. Discussions followed the reading of each of these papers and much interest was shown by those present.

F. J. SEAVER.

PUBLICATIONS OF THE STAFF, SCHOLARS AND STUDENTS OF THE NEW YORK BOTANICAL GARDEN DURING THE YEAR 1908.

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——— The published work of Lucien Marcus Underwood. Bull. Torrey Club **35**: 17–38. 29 F 1908.

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——— Notes on ferns seen during the summer of 1908. Torreya **8**: 284–286. 6 Ja 1909.

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Gager, C. S. Kellogg's Darwinism of today. Torreya 8: 17–19. 27 Ja 1908. (Review.)

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NOTES, NEWS AND COMMENT.

Mr. T. J. Fitzpatrick, of Iowa, spent two days in the library of the Garden looking up notes on the life and writings of Rafinesque.

Mr. C. J. Humphrey, assistant in the department of botany at Cornell University, spent several days at the Garden the latter part of December, studying fungi of the family Polyporaceae.

Dr. Shigeo Yamanouchi, a former student, called at the Garden in December. At present Dr. Yamanouchi is connected with the department of botany of Chicago University and is on his way to Naples, Italy, where he will carry on investigations at the Naples Zoölogical Station.

Professor Elsworth Bethel, president of the Colorado Academy of Science, spent a few hours looking over the collections of the Garden on December 7. Professor Bethel was on his way to Washington to attend the conference called by President Roosevelt to discuss the question of "Conservation of Natural Resources." For some time past Professor Bethel has been prominent in the work in the fungous flora of Colorado, as well as in other phases of local botanical work.

Mr. Wm. R. Maxon, assistant curator, U. S. National Museum, Washington, D. C., served as an assistant curator at the Garden during the month of December and was engaged in studying and

arranging the fern collections in connection with his work on "North American Flora."

Dr. C. F. Millspaugh, curator of botany at the Field Museum of Natural History, Chicago, recently spent a month at the Garden carrying on further investigations on the flora of the Bahamas in coöperation with Dr. N. L. Britton.

Mr. G. V. Nash, head gardener, visited the National Museum, Washington, and the Philadelphia Academy of Natural Sciences during December to examine the collections of grasses at these institutions in connection with his work on "North American Flora."

Dr. J. K. Small, head curator of the museums and herbarium, accompanied by Mr. J. J. Carter, of Pleasant Grove, Pa., left for South Florida on January 2, expecting to devote four or five weeks to botanical exploration and collecting on the everglade keys, in continuation of his previous work in that region and his studies of the plants of the southeastern United States.

Dr. J. A. Shafer, museum custodian, sailed for Nuevitas, Cuba, on January 13. He has been commissioned to spend about three months collecting in the northeastern portion of that island, which has been little visited by botanists.

The plant of *Crassula portulacea* in house number six of the large conservatories is in full flower. This plant is a South African representative of the Orpine family and it is one of the few plants of the family that have a woody trunk. The Hottentots eat the roots of this under the vernacular name of "T'Karckay."

Garden Memoirs, Vol. 4, "Effects of the Rays of Radium on Plants," by Dr. C. S. Gager, late director of the laboratories, was issued December 2, 1908; the volume is illustrated by 73 figures and 14 plates.

Meteorology for December.—The total precipitation recorded for December was 2.32 inches. Maximum temperatures were recorded of 67.5° on the 1st, 54.7° on the 7th, 49.8° on the 14th, 48.3° on the 21st, and 49.7° on the 29th; also minimum tem-

peratures of 16.5° on the 6th, 18.5° on the 11th, 18.7° on the 19th, and 14.7° on the 24th. Mean temperature for the month was 41.1°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

25 specimens "Fungi Dakotenses." (Given by Dr. J. F. Brenckle.)

18 specimens of lichens from North Dakota and Minnesota. (Given by Dr. J. F. Brenckle.)

175 specimens of mosses from the Pacific Islands, Asia, South America and Australia. (By exchange with Professor V. F. Brotherus.)

1 specimen of *Orthotrichum speciosum* from Firehole River, Yellowstone National Park, Wyoming. (Given by Mr. E. J. Hill.)

50 specimens "Lichenes Suecici Exsiccati," Fasc. III. and IV. (Distributed by Dr. G. O. A. Malme.)

212 specimens of varnish resins. (Given by Mr. A. P. Bjerregaard.)

88 specimens of hepatics from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

1 museum specimen of *Atractylis gummifera*. (Given by Dr. H. H. Rusby.)

1 specimen of *Sagittaria* from Long Island. (Given by Mr. E. P. Bicknell.)

1 hepatic from New Hampshire. (Given by Miss Annie Lorenz.)

160 specimens of mosses from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

17 specimens of mosses from Iceland, Spitzbergen and Faroe Islands. (Given by Miss Julia T. Emerson.)

100 specimens of fungi from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

21 specimens from Hawaiian Islands. (Given by Dr. H. Hapeman.)

231 specimens from Bermuda. (Collected by Mr. Stewardson Brown.)

81 specimens of American grasses. (By exchange with the Bureau of Plant Industry, Washington, D. C.)

30,000 specimens, being the herbarium of the late Dr. Otto Kuntze.

8 specimens of types of New Mexican plants. (Given by Professor E. O. Wooton.)

25 museum specimens from Jamaica. Collected by Dr. N. L. Britton.)

11 specimens from North Dakota. (Given by Professor Bergman.)

13 specimens of *Carices* from Nantucket. (Given by Mr. E. P. Bicknell.)

PLANTS AND SEEDS.

15 plants of *Rhipsalis* for conservatories. (By exchange with La Mortola Gardens, Italy.)

1 plant of *Epiphyllum* for conservatories. (Given by Miss M. E. Schumacher.)

26 plants from China for conservatories. (By exchange with Bureau of Plant Industry, U. S. Department of Agriculture.)

3 orchids for conservatories. (By exchange with Mr. J. A. Manda.)

3 begonias for conservatories. (Given by Mr. J. V. Borin.)

1 packet of seed from Bolivia. (Given by Dr. H. H. Rusby.)

1 packet of *Aristolochia* seed. (By exchange with Public Gardens, Jamaica.)

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PUBLICATIONS

OF

The New York Botanical Garden

Journal of the New York Botanical Garden, monthly, illustrated, containing notes, and non-technical articles of general interest. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp. Vol. II, 1901, viii + 204 pp. Vol. III, 1902, viii + 244 pp. Vol. IV, 1903, viii + 238 pp. Vol. V, 1904, viii+242 pp. Vol. VI, 1905, viii+224 pp. Vol. VII, 1906, viii + 300 pp. Vol. VIII, 1907, viii + 290 pp. Vol. IX, 1908, viii+242 pp.

Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations carried out in the Garden; to others, $3.00 per volume. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Vol. II, Nos. 6–8, 518 pp., 30 plates, 1901–1903. Vol. III, Nos. 9–11, 463 pp., 37 plates, 1903–1905. Vol. IV, Nos. 12–14, 479 pp., 14 plates, 1905–1907. Vol. V, Nos. 15–18, 463 pp., 17 plates, 1906–1908; Vol. VI, No. 19, 114 pp., 1908.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies and Central America. Planned to be completed in thirty volumes. Roy. 8vo. Each volume to consist of four or more parts. Subscription price $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Vol. 22, part 1, issued May 22, 1905. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae.

Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

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EDITOR

PERCY WILSON

Administrative Assistant

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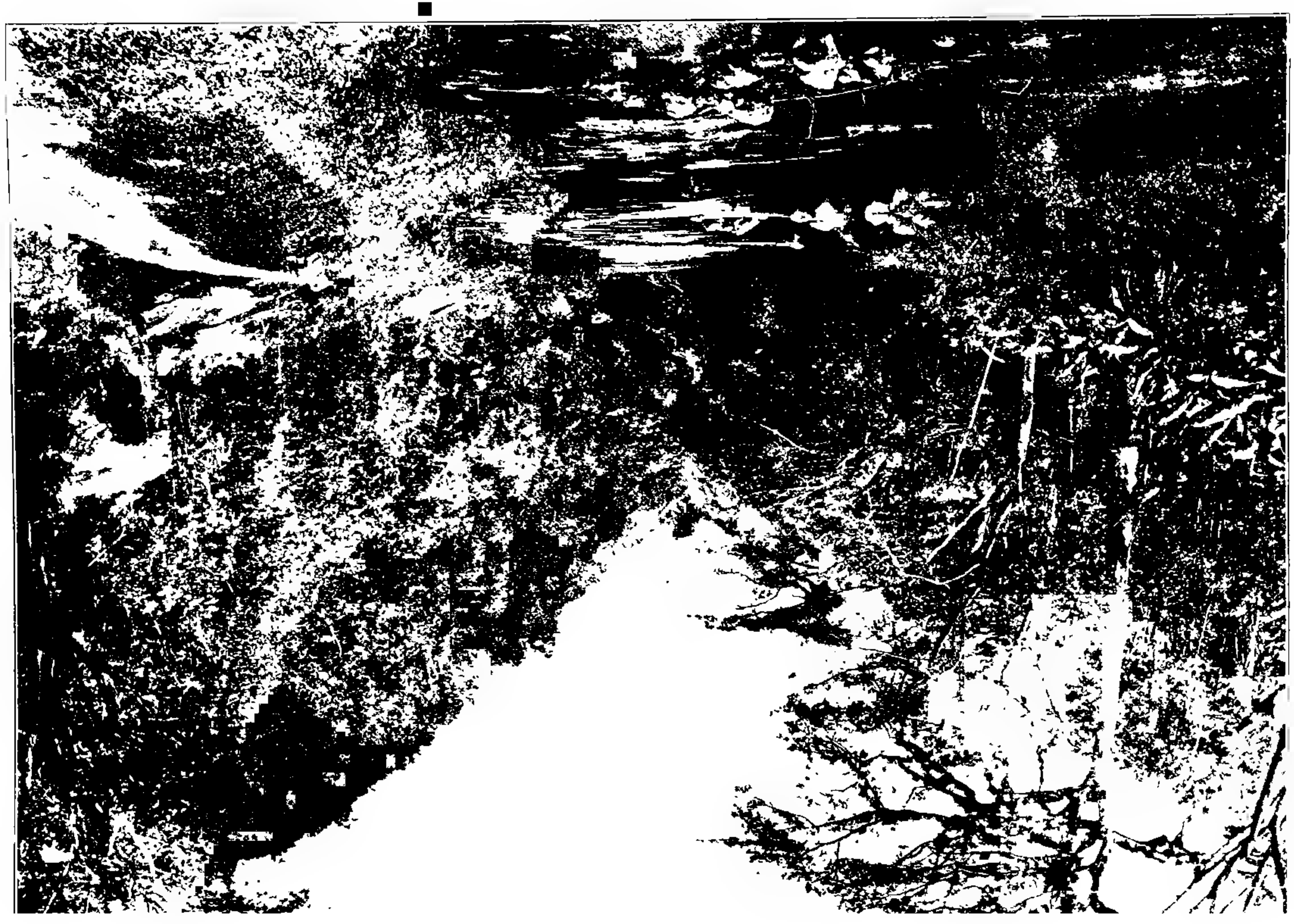

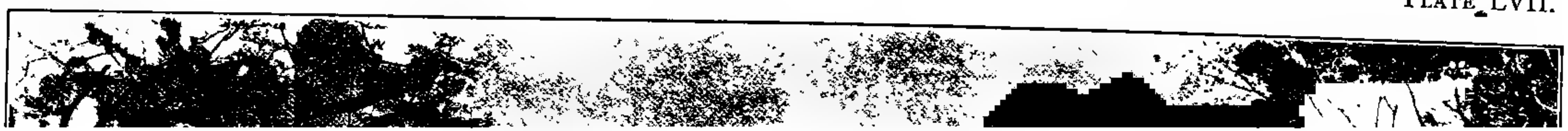

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COLLECTING FUNGI IN JAMAICA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: In accordance with your instructions, I left New York on the afternoon of December 5 with Mrs. Murrill on the S. S. "Prinz August Wilhelm," of the Hamburg-American Line, for Kingston, Jamaica. Watling's Island was passed in the forenoon of December 9 and a short stop was made at Fortune Island in the afternoon, these two islands giving a very good idea of the character of most of the Bahamian group. At daybreak next morning, Cape Maisi, the eastern extremity of Cuba, was reached and a superb view obtained of the precipitous south side of the island just beyond the cape, with its deep cañons and dry foothills but sparsely covered with desert vegetation. During the day the mountains of Haïti, said to reach elevations of 10,000 feet or more, about 2,000 feet higher than any other mountains in the West Indies, were dimly visible in the distance on our left. The revolution there in progress only emphasized the need of a stable government to make exploration and development possible, where the natural resources in lumber, minerals and virgin soil are at present probably greater than in any other island of the West Indian group.

In the afternoon of December 10 the mountains of Jamaica became visible ahead, and we anchored in the harbor at Kingston about midnight. Early the next morning we drove through Kingston to the Constant Spring Hotel and established our headquarters there for the remainder of the month. In the

afternoon we visited Hope Gardens and were entertained at the home of Mr. William Harris, Superintendent of Public Gardens and Plantations, who very kindly assisted us with the details of plans for exploration during our stay in the island. The next morning being Saturday, we visited the large Kingston market with Miss May Harris at an early hour to see the various fruits

FIG. 1. Hope Gardens and the hills to the north. On the left is the residence of the director.

and vegetables brought in by the market-women from the neighboring hills.

Oranges, grapefruit, limes, pineapples, bananas, papaws, watermelons, muskmelons, sweet-sop, sour-sop, cherimoyer, a few late mangoes, cocoanuts, yams, coco, sweet potatoes, cassava, tomatoes, plantains, pumpkins, squash, guavas, eggplant, breadfruit, jackfruit alligator-pears, annatto, ackee, rice, cabbage, cucumbers, beans, onions, cocoa-beans, sugar-cane, sugar, ginger, pimento, coffee and tobacco were the principal products found in the market in December. It is surprising how few of these are

native to the island, most of them having been introduced from the old world. The original Arawak Indians, exterminated by the Spaniards, lived principally on fish, cassava and the common wild yam. The papaw, guava and mammee are native.

The chief products of Jamaica are bananas, sugar, coffee, pimento or allspice, cocoanuts and ginger. The orange-market has been ruined by unscrupulous middlemen who were in the habit of buying up green fruit and shipping it to America early

FIG. 2. Residence of Mr. William Harris, Hope Gardens, Jamaica, showing *Eucalyptus citriodora, Bignonia venusta*, etc. Photographed by Dr. M. A. Howe.

in the season. After the Florida freeze many orange-plantations were put out in Jamaica, but few of them have been at all profitable. The seedless orange does not grow to perfection there, and the ordinary sweet orange, although delicious in flavor and very juicy, cannot be profitably marketed.

Kingston is situated on the dry side of the island and few fungi are to be found there except after the heavy rains in May and October, nevertheless a number of species, especially those growing on dead wood, were collected on December 12 and 13 in a rocky, shaded ravine east of Hope Gardens and in a sunken creek-bed west of Constant Spring Hotel, while fence posts and old logs in the fields contained certain common tropical American species in abundance, such as *Gloeophyllum striatum, Schizophyllum alneum, Pycnoporus sanguineus, Daedalea amani toides, Coriolus maximus, Coriolus membranaceus, Coriolus arenicola, Pogonomyces hydnoides,* and *Elfvingia tornata.*

On Monday morning, December 14, we drove to Castleton Gardens in company with Mr. Harris and his daughter, arriving at 11 A. M. The rainfall being much greater there, fungi were abundant. Thirty-four species were collected before luncheon, many of them different from those seen at Kingston. The more interesting portions of the gardens were examined under the guidance of Mr. Harris, and he returned to Hope Gardens that afternoon. Other collections of fungi were made later in the day and the specimens described and dried during the night in a special drying oven taken with me from New York.

Tuesday morning I collected in the banana, cocoa and hat-palm-plantations along the Wag Water River and obtained a number of interesting species, which were described and partially dried before 1 P. M., when we drove to Annotta Bay and took the 5:15 train for Port Antonio, arriving at the Titchfield Hotel about 7 o'clock. On the way to Annotta Bay we passed an old native sugar-mill, but the heavy rain prevented us from examining it. Mr. Pringle's immense estate on the lower meadows of the Wag Water River was passed shortly before reaching the railway station.

Our first excursion from Port Antonio was made December 16 to Moore Town, an old Maroon village ten miles to the south, at the foot of the Blue Mountains where the rainfall is very heavy. On a steep ridge to the west of Moore Town a stretch of moist virgin forest was found which yielded a num-

ber of interesting species, among them two agarics strongly resembling *Armillaria mellea* and *Volvaria bombycina* of our own temperate regions. The banana-plantations and fence-posts along the road were also rich in species. We lunched on sandwiches and cocoanut-water and returned to the hotel in time to prepare the specimens for drying that night. On account of the delicacy of the coloring and surface character of the fungi it is necessary to make descriptive notes and drawings by daylight, which fades all too soon in the tropics after sundown.

The next day, December 17, I left Mrs. Murrill in charge of the collections and drove eastward along the north shore by Blue Hole and Priestman's River, and some distance beyond turned inland toward the John Crow Mountains until the road became impassable for vehicles, the trail continuing to Manchioneal. The pasture-lands, banana and cocoanut-plantations, and stretches of virgin forest yielded rich and varied collections. A young cocoanut-grove near the end of my drive, about fifteen miles from Port Antonio, was particularly rich in species, partly because of the dead logs and stumps left from clearing the original forest. The shade of the cocoanut-palms, also, has probably aided in preserving some of the species that formerly grew in the forest. A magnificent clustered species of *Lepiota,* visible fifty yards from the road on an old stump of *Cedrela odorata,* was doubtless preserved in this way.

While collecting in this grove I was fortunate enough to meet Mr. Henslow, the owner of a cocoanut-plantation to the south, situated considerable higher up on the hills, containing trees a century old which are still vigorous and free from disease. Mr. Henslow pointed out trees ten years of age that had been sprayed with Bordeaux mixture for the bacterial disease of the bud which has wrought such havoc with the cocoanut in Cuba, the Bahamas, and elsewhere. This treatment has undoubtedly yielded good results, but the application of the mixture is sometimes a difficult problem.

The forenoon of Friday, December 18, was spent in caring for the large collections of the day before, and in the afternoon we drove westward along the shore as far as St. Margaret's

Bay, finding several species not previously collected, among them a beautiful cluster of *Pleurotus* and large sporophores of what appeared to be *Fomes auberianus* growing from the side of an irrigation ditch in a banana-field, just as it normally grows from a decayed log. The very large percentage of dead organic matter in the soil probably accounted for this peculiar habitat.

FIG. 3. Fruit and foliage of ackee, *Blighia sapida*, Hope Gardens, Jamaica. Photographed by Dr. M. A. Howe.

On Saturday, December 19, the collections in hand were completely dried, packed and shipped to New York by one of the United Fruit Company's steamers, through the kindness of Mr. Carter. The next morning at six o'clock we left Port Antonio by train for Kingston, arriving at the Constant Spring Hotel about noon.

On Monday, December 21, we drove to Newcastle, 3,719 feet above sea-level, in the forenoon, and, after a basket-lunch there,

drove over Hardware Gap and down to Silver Hill Gap, about twenty-five miles from Kingston, by three o'clock in the afternoon. Here the buggy left us and I waited with the luggage while Mrs. Murrill walked to Chester Vale, a distance of nearly two miles. While waiting for the bearers I collected sixteen species of minute fungi on the roadside at Silver Hill Gap.

FIG. 4. Jamaica negroes removing the seeds from cocoa-pods.

December 22 and 23 and the forenoon of December 24 were spent with Mr. and Mrs. Sidgwick at Chester Vale, where important collections were made at elevations of from 3,000 to 4,000 feet. The species found here and at Cinchona were for the most part strikingly distinct from those already collected. Jamaica has a foundation of igneous and metamorphic rocks, with white and yellow limestones and carbonaceous shales lying above. The geological formation may determine the soil, the elevation, and even the amount of moisture, all of which have a decided influence on the character of the fungi found in any given locality. In addition to this, the period when a given area was elevated above the sea may largely determine whether

the majority of the species are common to adjacent islands or are endemic. If the species at these higher elevations in the older parts of the island have affinities with those elsewhere, they are probably to be found in Honduras, on the mainland, but the percentage of endemic species is undoubtedly very large.

On the afternoon of December 24 we rode up the steep trail from Chester Vale to Cinchona, ascending 2,000 feet in a distance of three miles, and were most cordially received by Mrs. Taylor and her daughter, who did everything in their power to make our stay with them comfortable and pleasant. The weather was unusually rainy for the season, but sufficiently warm during the day, and in the evening we always had a wood fire. Fungi were abundant, the daily rains bringing them out in unusual numbers, and on account of the great quantity of dead wood near by, the result of the hurricane a few years ago, it was possible to collect them between showers in the immediate vicinity of the laboratory.

The trees blown down were mostly exotics, some of them of immense size, such as the blue-gum of Australia (*Eucalyptus globulus*) and Masson's pine, from China and Japan. The native red cedar (*Juniperus barbadensis*) was extremely abundant at this elevation, and its dead trunks and branches yielded a plentiful supply of *Tyromyces caesius,* a temperate species found usually on coniferous wood. Other conspicuous trees and shrubs on the grounds were: The Norfolk Island pine (*Araucaria excelsa*), *Podocarpus elongata, Juniperus chinensis, Grevillea robusta, Thuja, Cupressus, Duranta, Gordonia anomala, Carya olivaeformis, Liriodendron, Acalypha marginata, Dracaena terminalis, Cryptomeria japonica, Datura suaveolens,* cherimoyer, tree-tomato, peach, coffee, tree-ferns, various bamboos and palms, roses in great profusion and beauty, and several large clumps of pampas-grass (*Gynerium argenteum*). Numerous vines and smaller flowers added to the charm of this enchanted spot.

On Christmas day, fifty-one species of fungi were collected, among them *Boletus granulatus,* a temperate species not before reported from tropical America. Boleti are exceedingly scarce in tropical climates; only four species have been reported from our

ropics, two of them from Cuba, one from Costa Rica, and one rom Guadeloupe.

The evening of Christmas day was devoted to an unique cele- ›ration arranged by Mrs. Taylor and Mrs. Britton for the colored ›eople at Cinchona, the new and conspicuous feature being a arge tree of *Juniperus barbadensis* brilliantly lighted and heavily oaded with presents.

The next few days were spent in collecting and describing the ;pecies near at hand. Ponies and a guide were then secured and onger trips taken into the neighboring mountains. On Tuesday ınd Wednesday, December 29 and 30, we visited Morce's Gap, famous for its tree-ferns and filmy-ferns, and secured a number)f species peculiar to this and similar localities of great precipi- ation and dense shade. One of the most interesting novelties vas a handsome species of *Agaricus,* a near relative of the :ommon field-mushroom, discovered by Mrs. Murrill. Species)f *Clavaria* were also abundant, being adapted to dense shade.

It rained heavily the next two days and the trails were con- ;idered unsafe for horses, but there was plenty to occupy us ndoors and near by. *Boletus granulatus* and *Pluteus cervinus* vere found in such quantity on December 31 that we had them ;erved for dinner. It is generally unwise to eat fungi in foreign :ountries, but these two species were very well known and not ;asily confused with poisonous kinds, and were, moreover, very ;ood. On January 1, I explored the Latimer Trail for some dis- ance on foot, but this was the dry side of the mountain and nostly cultivated, so the collections were not extensive. The next lay, Saturday, Mrs. Murrill and I completed the exploration of Morce's Gap and vicinity, adding three species of *Hygrophorus,* wo species of *Tremella,* and several other novelties to our col- ections there. A rather severe earthquake shock was felt at 'o o'clock that morning.

On Monday, January 4, we rode to New Haven Gap, an ;levation of 5,600 feet, and made large collections along the rail near the end of our journey. Returning, we examined the)lantations of *Pinus Massoniana* and found that nearly all the leshy fungi had been eaten by the mongoose, which thus adds

one more to the list of serious charges against him. This animal, imported in 1872 to rid the cane-fields of rats, has exceeded his authority and cleaned out all the snakes and many of the small birds of Jamaica, thereby increasing the number of ticks and other insects.

On Tuesday, January 5, Mrs. Murrill, Miss Harris and I rode to Monkey Hill, arriving at the end of the horseback trail at 10 o'clock, where I took the guide and walked to the top of

FIG. 5. Characteristic negro hut, Jamaica.

Sir John Peak, at 6,100 feet elevation, by 11 A. M., lunching on the summit. The trail cut for Dr. Shreve is still open, but rough and weedy; the platform of poles used by him in his experiments is rapidly falling to decay; but the conspicuous clumps of a splendid species of grass discovered by him on the summit will forever associate his name with this peak. A bilberry (*Vaccinium*) and *Clethra Alexandri*, the latter reminding me of our mountain-ash in habit, were the most conspicuous woody plants on the summit. The *Clethra* was covered with a

species of mistletoe. Forty-four species of fungi were collected between Monkey Hill and the top of Sir John Peak, most of them common to wet localities at somewhat lower elevations. About nine species were additions to our collection. On returning to Monkey Hill I found that my horse had broken away from the

FIG. 6. View in Castleton Gardens, showing tree-ferns and other tropical vegetation.

tree-fern to which he had been fastened and had followed the other horses down to Cinchona, where I arrived somewhat later in a heavy rain. Mrs. Murrill and Miss Harris had intended to collect between the top of Monkey Hill and New Haven Gap, but they were driven homeward about midday by the threatening weather, the trail being very steep and treacherous in places, even when dry.

In the late afternoon of the same day, Mr. Harris secured for me a number of small specimens of "native bread" or "ground bread" from the exposed clay trail below Cinchona. These represent a species of "Tuckahoe" similar to that found

in the eastern United States, but the fruiting form of it is unknown. Mrs. Taylor collected "eggs" of a new species of *Clathrus*, found also at Hope Gardens by Mr. Harris and Dr. Britton, which were developed under a belljar and carefully studied.

All of January 6 was spent in the laboratory among the collections. On Thursday, January 7, I collected in the valley of the Clyde River and found a number of novelties, among them

FIG. 7. View of Cinchona, showing the principal buildings. The laboratory is in the background almost concealed by clumps of pampas-grass. Photographed by Dr. Forrest Shreve.

what appeared to be a new genus of phalloids, although I cannot be certain of this until the collections are studied. Unlike most phalloids, this species does not develop a special structure for the distribution of its spores, but the "egg" simply breaks open when the spores are mature and the contents are washed away by the rains.

On Friday, January 8, we left Cinchona and rode our ponies down to Hope Gardens, taking our luggage and collections with us on a pack mule. The specimens were left there in the care of Mr. Harris until finally packed for shipment. A number of fungi were picked up in the gardens the next day, and excellent specimens of a species of *Agaricus* were secured for me near the

Knutsford Park race-track by Miss Brooks. This same species was common about the house at Chester Vale and on the lawns at Hope Gardens and Constant Spring, where I found it growing in immense "fairy-rings." It reminded me very much of *A. arvensis*, as it grows in some parts of Sweden, and it is certainly edible, although not often eaten in Jamaica. Three species of puff-ball were collected for me at Hope Gardens by Mr. Harris and I found a very large one growing in "fairy-rings" on the

FIG. 8. Scene in the forest near Cinchona, Jamaica.

golf-links at Constant Spring, which developed beneath the soil and burst through the ground at maturity covered with particles of soil and having an abundance of dirt enmeshed in the fibers of its outer coat.

We had now visited the Blue Mountains, the foothills of the John Crow Mountains, the lowlands on both sides of the eastern end of the island, and the middle altitudes between Constant Spring and Annotta Bay. Our plans also included a visit to the Cockpit Country in Trelawney, and to Moneague, in the celebrated parish of St. Ann. We were fortunate in having the

company of Mr. Harris during our stay in Trelawney. This wild and difficult region was unknown to botanists until "discovered" by Mr. Harris and Professor Underwood a few years ago. Since then a number of persons from our institution have visited it and brought away rich botanical treasures. The formation is white limestone, elevated 2,000 feet or more above sea-level and eroded by solution into numberless conical hills of similar size and appearance, separated by pits or sink-holes

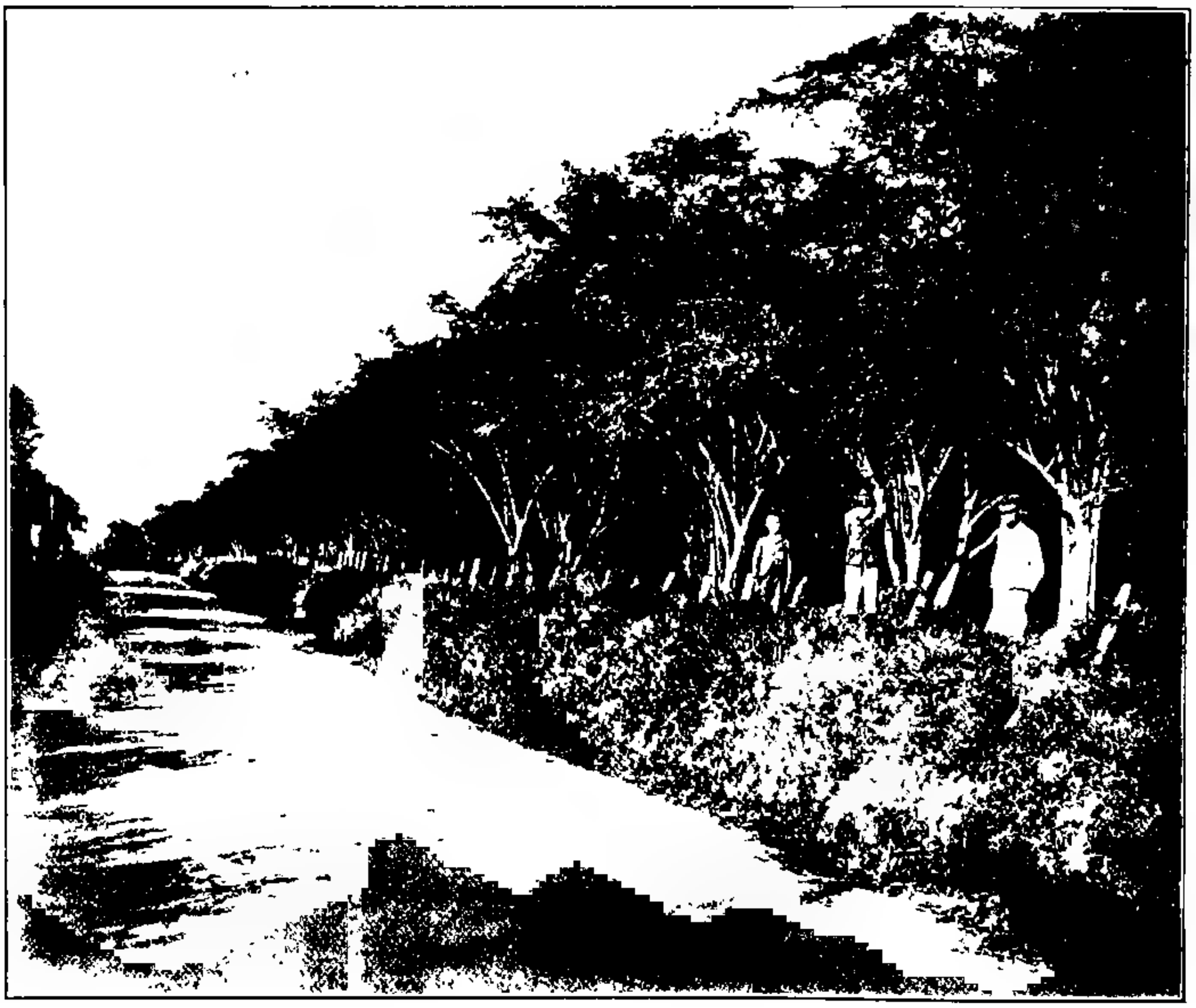

FIG. 9. Logwood-plantation near Montego Bay, Jamaica. Photographed by Dr. M. A. Howe.

varying in depth and extent. The region is rough, heavily wooded, without water, without distinct trails, and without landmarks, so that native guides are necessary for even short journeys. It contains an abundance of mahogany, Spanish cedar, mahoe, yacca, satinwood, and other excellent timber trees, but these are largely unavailable at present.

On Monday, January 11, we left Kingston with Mr. Harris

by train for Balaclava, which we reached at 3 o'clock, in time to drive the eight miles to Troy before sundown. Here we were entertained in handsome style by Mr. Carter, the bailiff of the district and the owner of an extensive tract of land in the edge of the Cockpit Country. He also has charge of the immense government holdings to the north and west of Troy and Tyre. Mr. Carter's house is situated on an eminence overlooking a beautiful valley, the slope on the north side adjoining the yard being covered with between one hundred and fifty and two hundred species of native trees, the individuals well separated and splendidly developed, forming the finest natural arboretum in the island, if not in the West Indies. Some photographs of these trees were taken for publication by Mr. Cousins shortly before our visit.

On Tuesday, January 12, Mr. Harris and I collected in Troy, securing over a hundred species, many of them different from those seen elsewhere. A gray, campanulate species of *Laschia,* found by Mr. Harris, was particularly interesting and attractive. I discovered an undescribed species of *Boletus,* making six in all known from tropical America. On January 13, we spent the day in Tyre, being fully as successful as on the previous day. We were fortunate in having fair weather, as it usually rains in the Cockpit Country, and we had a guide who knew the "yam-trails," the "water-holes," and the wet and dry localities to perfection. He carried a "fire-stick," as most of the natives there do, with which he quickly made a smoke at noon to keep away the swarms of mosquitoes while we ate our lunch. His small son carried a large calabash gourd filled with water, this being the only water we saw during the day except in one deep, shady ravine where a deposit of clay had prevented its escape through the porous limestone below.

Parrots are abundant in this region, the yellow-billed species being most common. Wild pigs are frequent and are often hunted. The natives dig wild yams and cultivate small patches of cocoa, pimento, annatto, ginger, coffee, bananas, yams and sweet potatoes. On the larger estates, cattle are raised, and bananas, coffee and pimento grown on an extensive scale. Most of the region, however, is uncultivated and uninhabited.

On Thursday, January 14, I had to remain at home and assist Mrs. Murrill in caring for the large collections, while Mr. Harris made an extended excursion for flowering plants. The next day we returned to Kingston, arriving at 3 P. M. Along the railway we saw large groves of logwood in flower, the conspicuous yellow blossoms attracting swarms of bees, which furnish the famous "logwood-honey" of commerce. At the stations, log-

FIG. 10. Pimento-grove near Montego Bay, Jamaica. Photographed by Dr. M. A. Howe.

wood chipped clean of all the light-colored sapwood was being weighed for shipment to England, Germany and elsewhere. I was told by Mr. Harris that the logwood industry in Jamaica had not been injured at all by the introduction of aniline dyes. The logwood-tree grows spontaneously in abundance on the plains and requires no cultivation except thinning. The dye is formed only in the heart-wood of the trunk and roots, from which it is extracted by a secret process and sold in the liquid

form, very much as our "tannin extract" from chestnut is marketed. An unknown disease of the logwood, which spreads from one tree to another through the roots, causes considerable damage in some localities.

On Saturday, January 16, Mrs. Murrill and I left Kingston at 2:15 P. M. by train for Ewarton, arriving at 4 o'clock, and drove from there over Mt. Diabolo to Moneague, a distance of ten miles. The afternoon was perfect and the view from Mt. Diabolo over the great plain of St. Thomas-in-the-Vale to the foothills of the Blue Mountains in the distance was one of the finest of its kind seen in the island. On the other side of the mountain we entered the parish of St. Ann, the largest and coolest parish in Jamaica, often referred to as the "Garden of Jamaica." The hotel at Moneague is exceedingly well managed, and Mr. Sims, the genial host, showed us much kindness during our stay of three days.

Collections were made in the grove, gardens and pastures about the hotel, and in the virgin forests in the direction of Union Hill, at an elevation of from 1,500 to 2,200 feet. The geological formation is similar to that of the Cockpit Country and the elevation nearly the same, so that any considerable variation in the character of the flora was not to be expected. As a matter of fact, it proved to be largely identical with that or Troy and Tyre, with an admixture of species found at Castleton Gardens and a few new elements.

I was entertained at Union Hill by T. B. Sturridge, Esq., who rescued me from a heavy shower of rain and insisted upon my remaining with him to breakfast. He has a large coffee and pimento estate, with a splendid barbacue cut from the solid rock of the mountain top, having the appearance of a fortress. He showed me how the pimento was gathered, dried, fanned and stored in large sacks for the European market. This crop has no diseases and no enemies except the yellow-billed parrot, which wantonly cuts off the clusters of berries in a wholesale and very wasteful manner. Mr. Sturridge also gave me specimens of the native trap-door spider and its curious nest, a banana bird's nest, made of dark vegetable fibers much resembling

horsehair, the nest of the doctor-bird (*Aithurus polytmus*), the largest hummingbird in the island, and the very peculiar nest of the swift, which is made from the silk of the ceiba-tree and the down of various species of *Tillandsia*.

On January 19 we returned to Kingston and spent the next day at Hope Gardens packing the various collections for the return trip to New York. In the afternoon we were entertained at the home of Hon. H. H. Cousins, Director of Agriculture, who showed his kindness in many ways during our stay in Jamaica. In the evening a farewell dinner was given us by Mrs. Brooks.

On January 21 we sailed from Kingston on the S.S. "Prinz August Wilhelm," arriving in New York January 27.

The results of our expedition cannot be definitely stated at present. Large collections of fungi were obtained, from fourteen distinct localities, with complete descriptions of perishable species and various field notes of importance and interest. Over two hundred colored illustrations of interesting species were obtained by Mrs. Murrill, which supplement the descriptions and specimens in the best possible manner. The species of fungi heretofore reported from Jamaica have been exceedingly few, partly owing to the fact that most of the forms are concealed by other vegetation and must be diligently sought for. Prodigal nature has also, under most favorable conditions of heat and moisture, clothed every available spot with vigorous *green* plants, driving the fungi to dead wood and chance openings in soil too rich in humus or two shady for other plants to thrive.

The fungi of Jamaica, like the higher plants, are extremely local, having probably developed and grown in the same localities for long periods of time, where changes in climate have been neither frequent nor pronounced and erosion has been greatly retarded by the heavy carpet of vegetation and the absence of frost and snow. Under these conditions many "endemic" species would be produced, either from originals now lost or by variation from species introduced at later periods from neighboring lands.

The best growing seasons for fungi in Jamaica are probably just after the May and October rains. The species are adapted to relative amounts of heat and moisture, responding to the

stimulus of the best growing seasons and resting during comparatively dry or cool weather. The past season was unusually wet far into January, which was our good fortune.

Respectfully submitted,

W. A. MURRILL,

Assistant Director.

CONFERENCE NOTES.

The regular monthly conference of the scientific staff and students of the Garden met on January 6 and was presided over by Dr. N. L. Britton. At this meeting several papers were read.

Dr. Marshall A. Howe first described several species of *Neomeris,* forms of marine, calcified, green algae which, partly from their small size and in part on account of the obscure places in which they grow, have been very little studied until comparatively recent years. As is often the case with simpler forms of plant life, they were confused by the earlier writers with those of the animal kingdom, some of which they quite closely resemble in general appearance. Little is known of the details of reproduction of these plants since these facts must be acquired by a very close and careful study of the plants in their living condition and so far no one has found the time to carry on such observations. It is thought, from analogy, that the spores which are produced at the ends of the primary branches form sexual cells on germination, two of which must unite in order that a new individual may be produced, but these points have never been demonstrated with certainty. From the work of Dr. Howe, based on material collected by him in the West Indies and by others in the Pacific and Indian oceans, he has been able to work out six well-defined species where but two were known to exist up to 1904.

Mrs. N. L. Britton outlined the results of her critical study on some Mexican mosses contained in the Pringle collection, displaying some of the more interesting forms. As a result of this study several supposed species have been eliminated and of the one hundred and eighteen species examined ten are to be recorded as new. Mention was also made of the fact that two species of fossil moss

collected at Elephant Point, Alaska, are identical with living species, one of these having been previously reported on. These facts are of interest since they furnish an index to the conditions of climate of that region at the time these deposits were made.

Mr. R. S. Williams also reported some of the results of his study on Mexican mosses of the collection referred to above, and discussed briefly the matter of distribution. In addition to the new species reported by Mrs. Britton, Mr. Williams added three to the list.

Dr. N. L. Britton exhibited models in wax of flowers, leaves and fruit of some of the higher plants which are so real that it is difficult to distinguish them from the natural objects. Such models are prepared for exhibition in public museums and are valuable for illustrating plants which cannot be shown in conservatories.

F. J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. W. A. Murrill, assistant director, and Mrs. Murrill returned from Jamaica, January 27, bringing a large number of fleshy fungi collected at fourteen different localities on the island, many of which represent species new to science.

Dr. J. K. Small, head curator of the museums and herbarium, has recently returned from an exploring trip to the everglade keys of south Florida. A large number of herbarium specimens and some living plants were secured, and many observations made, all of which will furnish valuable material for the furtherance of his studies on the flora of the southeastern United States.

Dr. L. W. Riddle, instructor in botany in Wellesley College, recently spent several days at the Garden, consulting the lichen collection.

Mr. W. W. Eggleston spent several months in North Carolina, southwestern Virginia, eastern and central Tennessee and Georgia during the past summer, engaged in studying and collecting North American thorns, genus *Crataegus*, of which he secured several thousand specimens. He has been assigned a research

scholarship at the Garden for one month to aid him in continuing his work upon this interesting genus.

Dr. N. L. Britton, director-in-chief, accompanied by Mrs. Britton and Dr. Marshall A. Howe, curator of the museums, sailed for Jamaica, February 20, expecting to be absent about six weeks. He has planned to visit the eastern parts of Jamaica and Cuba, and possibly some of the southwestern Bahamian islands.

An interesting and beautiful cycad, collected by Dr. D. T. MacDougal and Dr. J. N. Rose in Tomellin Cañon, Mexico, in 1906, has only within the last few weeks shown signs of growth and has developed a fine crown of leaves. This plant may prove to be a new species of *Dioon*.

Meteorology for January.—The total precipitation recorded for the month was 3.47 inches. Maximum temperatures were recorded of 49.7° on the 3d, 56° on the 5th and 6th, 53° on the 11th, 51.7° on the 22d, and 55° on the 25th; also minimum temperatures were recorded of 19.7° on the 2d, 13.5° on the 8th, 15° on the 16th, 3.7° on the 19th, and 20° on the 31st. Mean temperature for the month was 29.85°.

ACCESSIONS.

LIBRARY ACCESSIONS FROM DECEMBER 1, 1908, TO JANUARY 31, 1909.

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MUSEUM AND HERBARIUM.

8 specimens of flowering plants from Iowa. (By exchange with Mr. M. P. Somes.)

1 specimen of *Microlejeunea ulicina* (Tayl.) Evans from Nova Scotia. (Given by Mr. J. D. Lowe.)

2 specimens of hepatics from New Hampshire. (Given by Mrs. Annie Lorenz.)

45 specimens of flowering plants from Iceland and Spitzbergen. (Given by Miss Julia T. Emerson.)

14 specimens of *Panicum* from the eastern United States. (Given by Mr. Witmer Stone.)

1 specimen of *Potamogeton* from Nantucket, Mass. (Given by Mr. E. P. Bicknell.)

329 specimens of flowering plants. (By exchange with the University of Copenhagen.)

1 specimen of *Quercus Pricei* Sudw. (By exchange with the United States Forest Service.)

2 specimens of Texan hickory-nuts and pecan-nuts. (Given by Dr. Robert T. Morris.)

30 specimens for the drug collection. (Given by Dr. H. H. Rusby.)

2 specimens, twigs and fruits, of *Hicoria microcarpa*. (Given by Dr. J. A. Shafer.)

1 specimen of "Guayule" from Sonora, Mexico. (Given by Dr. F. J. H. Merrill.)

31 specimens of commercial powdered drugs. (Given by Dr. H. H. Rusby.)

248 specimens of flowering plants. (By exchange with the United States National Museum.)

276 specimens of flowering plants from Missouri. (Collected by Mr. B. F. Bush.)

16 specimens of *Euphorbia elastica* and various fruits from Mexico. (Given by Dr. H. H. Rusby.)

SEEDS AND PLANTS.

1 plant of *Epiphyllum* for conservatories. (Given by Miss E. Schumacher.)

6 cuttings of *Peperomia reflexa?* for conservatories. (Given by Dr. H. H. Rusby.)

2 cacti for the conservatories. (By exchange with United States National Museum, through Dr. J. N. Rose.)

15 plants for conservatories. (By exchange with Mr. Frank Weinberg.)

50 plants of *Dionaea muscipula* for conservatories. (Purchased.)

1 packet of seed for conservatories. (By exchange with Hortus Tenggerensis, Lawang, Java.)

2 packets of *Crataegus* seed from Colorado. (Given by Mr. W. W. Eggleston.)

43 packets of *Crataegus* seed. (Collected in North Carolina, Georgia and Tennessee, by Mr. W. W. Eggleston.)

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Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

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OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

OF

The New York Botanical Garden

VOL. X. March, 1909. No. 111.

SPRING LECTURES, 1909.

Lectures will be delivered in the lecture hall of the museum building of the Garden, Bronx Park, on Saturday afternoons, at 4:00 o'clock, as follows:

April 24. "A Winter in Jamaica," by Dr. William A. Murrill.

May 1. "Spring Flowers," by Dr. Nathaniel L. Britton.

May 8. "How Plants Grow," by Dr. Herbert M. Richards.

May 15. "Evergreens: How to Know and Cultivate Them," by Mr. George V. Nash.

May 22. "Collecting Seaweeds in Tropical Waters," by Dr. Marshall A. Howe.

May 29. "Vanilla and Its Substitutes," by Dr. Henry H. Rusby.

June 5. "The Selection and Care of Shade Trees," by Dr. William A. Murrill.

June 12. "The Ice Age and Its Influence on the Vegetation of the World," by Dr. Arthur Hollick.

June 19. "Haïti, the Negro Republic, as seen by a Botanist," by Mr. George V. Nash.

June 26. "Some American Botanists of Former Days," by Dr. John H. Barnhart.

July 3. "An Expedition up the Peribonca River, Canada," by Dr. Carlton C. Curtis.

July 10. "Collecting Experiences in the West Indies," by Dr. Nathaniel L. Britton.

The lectures will be illustrated by lantern slides and otherwise.

They will close in time for auditors to take the 5:34 train from the Botanical Garden Station, arriving at Grand Central Station at 6:04 P. M.

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

EXPLORATION IN THE EVERGLADES.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: An attempt on the part of the writer and his associates to reach the southwestern extremity of the Everglade Keys during the fall of 1906 was defeated by conditions brought about by a severe hurricane. However, the supposed topography and vegetation of that unique and fascinating, and perhaps least known portion of the United States, continued to excite a desire to explore beyond the point where our progress had been interrupted. Consequently, having prepared plans based on the experience gained during previous work in the everglades, with your permission I left New York for Florida on January 2, in company with Mr. J. J. Carter, of Pleasant Grove, Pennsylvania, my former associate in the exploration of South Florida.

Upon reaching Miami, we at once made the Subtropical Laboratory and Garden of the United States Department of Agriculture our general headquarters, by the invitation of Mr. P. J. Wester, who is in charge of that important branch of the Bureau of Plant Industry, and we here wish to express our thanks to Mr. Wester and his associates for doing all in their power to facilitate our work.

The principal undertaking before us was the exploration of the group of keys forming the southwestern extension of the everglade reef or chain of islands. This group, extending westward

from near Camp Jackson for about ten miles and thence southwestward for about eight miles, dies out in the everglades eighteen miles from Cape Sable. It is popularly known as Long Key, and has furnished the basis of much misunderstanding among the native Floridians and superstition among the Seminole Indians.

While awaiting the arrival of baggage delayed in transit from the north, we took occasion to visit some of the upper Florida Keys, including the group of Ragged Keys, making notes of observations and complete collections of the plants inhabiting them. Our main object was to determine whether or not Soldier Key and the Ragged Keys really belong to the Florida Keys, from the standpoint of their structure and vegetation. The fact that these islands are members of the Florida Keys was demonstrated in the affirmative by evidence furnished by their coral structure and tropical vegetation. Thus Soldier Key is to be considered the most northern member of the Florida Keys. A glance at a map of that region will also indicate that it is separated from the two islands lying north of it by about five miles of water, including a natural channel. The two islands just referred to, namely, Virginia Key and Key Biscayne, are generally included among the Florida Keys; but a previous study of their structure and vegetation proved them to be merely detached portions of the narrow coastal peninsula, which thus ends at the historic Cape Florida. Soldier Key consists of several acres of partially sand-covered coral-rock with both herbaceous and woody vegetation, the number of species growing there amounting to about five dozen. The Ragged Keys lie about five miles south of Soldier Key and consist of about six islands, the majority of them being larger than Soldier Key. They are well named for they are very unequal in size and uneven in shape, and are irregularly placed. Their plant-covering is also varied and uneven. Some of the islands harbor but a few inconspicuous herbs, while others are densely wooded. The total number of species there is about double that of Soldier Key.

Having finally assembled our supplies and camp-outfit at Homestead, the nearest settlement to our objective point, we set

out on foot for Camp Jackson, where we arrived just after sundown on the first day. To this point our party consisted, in addition to Mr. Carter and the writer, of one camp-man, two carriers and one beast of burden, a blind mule. As the trail from Homestead to Camp Jackson is rough beyond the power of words to describe, the mule's misfortune was really a blessing, for he was thus saved the mental strain, the sight of the almost impassable trail might have caused him and the physical pain he would have suffered had a view of the trail caused him to become balky and necessary persuasive methods had been applied. However, in spite of the loss of the shoes from his feet and the skin from his shins, he emerged none the worse for his experience. Camp Jackson is the limit of transportation for any domesticated creatures except man and dog. The mule having been dispensed with, and the baggage divided between the members of the party, a start was made for camp on Long Key four miles distant. Misgivings arose in our minds before we had proceeded a quarter of a mile from camp, for we found the intervening everglades filled with water as a result of the unseasonable rains of the previous week. Doubting the advisability of then proceeding further, we pushed on for three miles through mud and water on the one hand and heavy showers on the other, before we definitely ascertained that the water was too high about Long Key for the prosecution of our intended work.

Greatly disappointed, we were compelled to retrace our steps to Camp Jackson, carefully avoiding stepping on the water-moccasins which seemed to arise from the mud and water about us as if by magic. While drying our clothes around the camp-fire and mending our shoes which had nearly been destroyed during the few hours spent in the attempt to reach Long Key, we formulated plans for further action. With good prospects for clearing weather, it was decided to postpone our exploration of Long Key, assuming that the water in the everglades would subside sufficiently within a week or ten days time to warrant another attempt on that line. Thus reversing some of our previously made plans, we called the blind mule into service again and returned to Homestead the following day. Storing our supplies

there, we went directly to Key Largo and spent several days exploring the southern portion of that key for a distance of about fifteen miles. We found a considerable original forest about the middle of the key, where four species of cactus were quite common, two spreading opuntias, one spine-armed and one spineless, and two climbing forms, one a *Cereus* with three-angled stems, the other a *Harrisia*, with fluted stems. The leaf-mould in the forest was very deep, in some places covering the coral-rock for a depth of one or two feet, but curiously enough, herbaceous vegetation was almost, if not completely, absent, and places where humus-loving orchids should have grown were barren. In such places the only visible plant not a shrub or tree was the climbing fern *Phymatodes exiguum*, a tropical American plant known from the United States only on Key Largo. On parts of the key where the forest had been cleared off we found several plants evidently lately introduced from other parts of the tropics, while near the lower end of the island we found *Thrinax floridana* growing at what seems to be the northern limit of the range of this beautiful palm, and also some specimens of the fourth species of cotton for the United States.

Returning to our general headquarters for a day, we arranged to visit several heretofore unexplored Everglade Keys belonging to the upper part of the chain, some on the extreme southeastern side and some on the extreme northwestern side. The investigation of these islands resulted in the discovery of several novelties for the flora of the United States, a typically West Indian shrub or small tree new to the Florida mainland and a collection of fresh flowers of one of the rarer and very diminutive flowering plants of our flora. This plant consists mainly of a leafless unbranched stem commonly one or two inches tall, the whole thing so inconspicuous that it has to be hunted for on hands and knees; it might be designated as the smallest flowering plant bearing the largest names, for it has borne the generic name *Polypompholix* and the specific name *longeciliata*. We encountered a peculiar phenomenon on a large island in the front prairie about eight miles below the settlement of Cutler. The tropical American fern *Odontosoria clavata* had heretofore been found in the United

States only in one isolated pot-hole near the trail between Homestead and Camp Jackson. All previous exploration on the Everglade Keys failed to bring the plant to light elsewhere. Curiously enough on this newly explored island nearly every pot-hole, both large and small, was lined on the eastern side with dense masses of this peculiar and graceful fern.

The rains having become less frequent and a steady dry southeast wind having set in, we assumed that the water in the everglades had fallen sufficiently to allow us to reach Long Key more conveniently than on our former trip, and to carry on at least some exploration there. Consequently, we again moved our baggage to Camp Jackson. After reaching that point, several hours spent in mud and water again brought us to a camping place on a small island which forms the eastern end of the Long Key group.

Here again, as in the case of our mule, nature was kind to us, and the advantageous make-up of our party was forcibly demonstrated. Our two carriers were strong men of moderate size, well suited to transporting a large amount of baggage; our camp-man on the other hand was over six feet tall and thin, and boasted of wearing a number thirteen shoe! This combination of peculiarities proved to be of great utility, for whenever one or another member of the party with a heavy pack would bog in a submerged pot-hole filled with soft mud, the camp-man, because of his superior height on the one hand and the area of his shoes on the other, would soon have his companion extracted.

After a night's rest in camp we set off at daybreak, with several days' rations, in nearly a direct line over the everglades for the southwestern extremity of the chain of islands, about fifteen miles distant, deviating from the line only to cross outlying islands near our course. On the most distant island visited we found another tree to add to the arboreous flora of the United States. Returning we crossed portions of the three larger islands which form the backbone of the group, exploring both the pinelands and such hammocks as had not been burned out by recent fires. The flora of the pinelands was both rich and interesting, but that of the small hammocks turned out to be rather disap-

pointing as compared with that of the hammocks twenty miles to the northeast. The larger hammocks certainly contained a more varied flora than the smaller ones, but the fires had been so recent that not a plant could be found in a condition to collect. The second journey was made along the northern side of the largest key for more than half its length. The everglades seem to be lower on the northern side than on the southern, for we found them submerged, and when the depth of the water prohibited further progress we gradually worked across the key towards the south, and returned to the supply-camp across the higher prairies. A third journey was made along a course close to the southern side of the largest key for eight or nine miles to the west, and then up through the narrow intersecting prairie into the everglades on the north side directly west of the point where we were forced to turn south on the second journey. We then returned to the supply-camp, crossing the largest key through both pinelands and hammocks.

The last day of the Long Key expedition was devoted to work on Royal Palm Hammock and the two smaller islands adjacent to its western side. Royal Palm Hammock is remarkable for the growth of palms (*Roystonea regia*), from which it takes its name. These trees are visible across the open everglades almost as far as the eye can reach, and curiously enough this species of palm is confined to this island, with the exception of two plants which grow on the small key which lies near its western side and a very few plants which exist on a key about two miles directly east. Royal Palm Hammock is also noted as being the only locality in the United States where several tropical American epiphytic orchids grow naturally.

These movements gave us a very good idea of the character of the islands and enabled us to collect from nearly all possible localities. The Long Key group resembles the upper and larger group in most particulars, but the country is much more rugged; everything has the appearance of being either unfinished or completely worn out. The rock, which forms the only dry land, is rough beyond the power of description and even beyond the power of imagination, except to those who have actually been

over it. The vegetation is decidedly stunted, the pines and the hardwood trees, although apparently of the same age as similar trees on the previously explored portion of the reef, attain mostly less than one half their size.

A large percentage of the area of the islands is so anomalous that the only way to describe the condition is to say that the surface consists chiefly of holes. The rock is honeycombed, the cavities commonly with a diameter of one to eight feet and with a similar depth, the partitions usually less than a foot thick and sometimes so much eroded that they will not bear one's weight. Progress over such areas is necessarily slow, for unless one picks his way with extreme care a fall would surely result which would mean a number of punctures and broken bones, if not more serious results.

In spite of general appearances the Everglade Keys are almost ideal for camping. Good firewood is plentiful and delicious cool water is always within easy reach. Besides a small tent to protect the food and specimens at the supply-camp, no shelter is essential. In the field at sundown it is only necessary to gather together enough firewood for the night, to start a fire and cut a few palm-leaves for a bed, and the camp is complete. In case of rain a piece of oilcloth or a small india-rubber poncho is sufficient protection, for the honey-combed rock has drainage like a sieve. Notwithstanding the decidedly cool nights, with a good camp-fire one may sleep with impunity in either wet or dry clothing. The total absence of dust and other irritating things from the atmosphere is noticeable both in the delightful effect of the air on the organs of respiration and the surprising apparent nearness of the stars on cloudless nights. Nearly all existing conditions redeem the monotony of the long nights, during which one is confined to the area within a few feet of the camp-fire, both on account of the dangerous honeycombed rock and the presence of venomous snakes. Three kinds of the latter are to be expected at any moment; the water-moccasin in wet places, the ground-rattlesnake in damp or moderately dry places and the diamond-rattlesnake on the dry rocks. Thus surrounded, one has a great desire to stay near the camp-fire at night.

We were surprised to meet with a number of plants, both herbaceous and woody, characteristic of more northern or cooler parts of the country. Among the woody plants the more conspicuous were the laurel-leaved greenbrier (*Smilax laurifolia*), Ward's willow (*Salix longipes*), sweet bay (*Magnolia virginiana*), Virginia creeper (*Parthenocissus quinquefolia*), persimmon (*Diospyros virginiana*), French mulberry (*Callicarpa americana*) and buttonbush (*Cephalanthus occidentalis*). The most interesting of these was the sweet bay, which occurred in diminutive forests, the plants assuming the form of a tree and ranging from one to three feet tall. Their trunks were characteristically buttressed, with a diameter of several inches at the base, tapering to about one half an inch a foot above. The diminutive trees bore both flowers and fruit.

Our last field work was done on the Vacca Keys, Crawl Keys and Grassy Key. We secured a good collection of the plants inhabiting these islands, including some additions to our flora, and a view of the remarkably dense growth of the palm, *Thrinax floridana*, which is well worth a trip there to see. There too we had the only really unpleasant experience of the expedition. For two days we were at the mercy of the mosquitoes. I will not attempt to describe our experience, but may say that the insects almost devoured us, and besides breathing and eating them, we had great difficulty in extracting them from our eyes and ears. We returned to New York on February 4, with a number of museum specimens, about fifteen hundred herbarium specimens, and notes on many important observations on the plant covering of the Everglade Keys.

Respectfully submitted,

J. K. SMALL,

Head Curator of the Museums and Herbarium.

THE EDUCATIONAL ORGANIZATION OF NATURE-STUDY.*

In the years since the introduction of nature-study into our schools there has been a series of conflicts sometimes alarming, sometimes petty, and not infrequently absurd between the scientist and the naturalist. There has been experiment and criticism, and until the subject crystallizes out from a mass of heterogeneous material, there will continue to be experiment and criticism. The selection of subject-matter from the vast amount of available material, and the formulation of this subject-matter into courses adapted to the different grades in our schools is still in the early stages of the evolutionary process.

The great trend of the lines of nature-study to-day is towards the concrete, the practical, the thing that is of use to the child. This is true not only of nature-study, but of all departments of education. "How does this bear upon the life of the child?" is the question of the hour as it has never been before. It is not sufficient that a thing in itself is interesting or curious, and pleases and amuses the child; we must look for that which is perhaps equally interesting and pleasing, and has the added quality of touching the child's life more or less directly.

For example, we no longer make a study of insects as insects, We no longer begin, "Now, children, here is a June-bug; let us learn all we can about him; he is a good example of the beetle; and when we have learned about the June-bug, we shall know a good deal about the whole class of beetles." Perhaps the last point to be made was that in the larval form the June-bug is a source of trouble in our lawns. Now we start at the other end. Here is a patch of dying grass on this beautiful lawn; we dig into the earth and find fat white grubs at work upon the roots of the grass; we take them into the schoolroom and keep them in a jar of earth; we dig them up from time to time and watch the change that is taking place; by and by the mature insect appears, and eager hands and eyes are ready to make the most of him.

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* Paper read at the Conference of the Scientific Staff and Students, December 2 1908.

Again, we do not teach the parts of the flower, because they are parts of the flower. The introduction may be through the bee when we are learning about the source of the honey on the breakfast-table, or it may come through our garden-work, as we see the bees going from flower to flower. The carrying of the pollen by the bee is of vast interest to the child. Where does he get it? How does he carry it? What does he do with it? What does the flower do with it? And because they want to talk about it and must have words, calyx and corolla, stamens and pistils, come naturally into the vocabulary of the child. It is not the parts of the flower but their functions that are of interest to him.

Neither do we at the present time teach the star-fish according to Mrs. Agassiz's "A First Lesson in Natural History." We were loth to give up the star-fish; those lessons were dear to the children. But we had to subject ourselves to the cross-examination of the times: How does this star-fish affect the lives of these children? At what point do the children and the star-fish come in contact? They cannot eat it; they cannot wear it; it does not make a good pet; the great mass of children in the United States live and grow up and die without ever seeing a living star-fish or perhaps a dead one. Is there *no* point where the star-fish touches the life of the child? Ah, yes! Through the oyster! The child eats oysters; the star-fish eats oysters; and the more the star-fish eats, the fewer there are for the child.

And so while we are studying about the oyster it takes perhaps no longer than five minutes for the children to learn all that was really gained formerly in one or more lessons wholly devoted to the star-fish. Where interest is aroused, assimilation is rapid. Moreover, the star-fish is not an isolated subject in the child's mind, but it occupies a place related in common to the oyster and to himself. This is not a scientific disposal of the star-fish, so long secure among the radiates. It must be humiliating to be taught no longer because one is a radiate, but because one eats oysters.

The child is not ready for scientific classification or organization, and to attempt it, is to fail in more ways than one, and to

lose that which is of far more importance in the early years. Yet to "teach the star-fish" and leave it an isolated subject, and to continue the same process with other subjects is to create for the child a world of objects and ideas neither related to themselves nor to the child. The question of unity is a vital one, and it seems to us to-day that in nature-study unity must be on an educational basis. Gradually and naturally, with increase of knowledge and development of the reasoning powers, this educational unity will become scientific.

What then shall we choose for subject-matter in nature-study and what shall be its order? When we remember that each individual is the center of his own universe, the question simplifies itself to some degree. To a certain extent the answer will vary with the environment of the child; nature-study for the country-child will differ somewhat from that of the city-child; still the governing principles are the same. Taking the normal child as the center, let the naturally widening circles of his environment furnish the subject-matter. These widening circles too often lose their symmetry in nature-study, and become an irregular coast-line with peninsulas and promontories, and worst of all, with shoals or outlying islands entirely cut off from the mainland. No one knows better than the teacher of nature-study the temptation to lead a bright-eyed eager child out into the unknown; but one must know where to turn back, and one must make sure that the child *can find his way back alone.* Our schools are full of *lost children* who cannot find their way back alone.

One bright Saturday morning not long since a lady sat watching a little girl in Riverside Park. The child skipped up to a cluster of dry seed-pods, shook them over her hand, and ran along the path scattering the seeds as she went; she flew up to some fluffy white balls of dandelions that had gone to seed, knelt in the grass, and blew the seeds as far as she could; then she began picking up the maple-keys from the walk. The curiosity of the lady on the bench was aroused and she approached the child: "What are you doing, little one?" she asked. "Helping nature," was the brief but enlightening reply, and the little maid danced away upon her mission, leaving in her wake a

shower of maple keys whose distribution-area was thus considerably widened.

Now if the teacher puts herself in the attitude of this little girl, and is willing to "help nature," instead of expecting nature to help her by making a dull geography-lesson more interesting, she will find that she and nature and geography can all help each other.

In the first and second grades, the *home and its immediate surroundings* furnish abundant material for nature-work. The domestic animals, and such animals as make desirable pets — the dog and cat, the rabbit, the canary, the goldfish — the squirrel that frisks in the yard, the butterfly that hovers about the flower-bed, the sparrows in the street — all these are good subjects. In the plant-world, the potted plants and window-boxes in the school-room, the common vegetables and their manner of growth, the planting of bulbs and the collection and planting of seeds are all things of absorbing interest to the child. The work should contain a large element of "doing," the child should take care of the pets and plants, he should feed the squirrel and the sparrows, he should gather the seeds and plant them. He should learn as much of habit and life-history as his years will allow. He may — because learning the names of things is the special business of children of this age and younger — he may in these grades learn the names of many things that are not studied. It is as natural for him to learn the names of the common birds and butterflies, trees and wild flowers and bright berries, as it is for him to know the names of the furniture about the house, or the dishes upon the table.

In the third grade the work may widen to the limits of what is called "*home-geography.*" The yard and its improvement furnishes endless material: trees, and their value for shade, for beauty, for fruit or nuts for children or for squirrels; vines, and their value for shade or screen, or cover for unsightly walls, also their value for fruit, or beauty of flower or autumn-coloring; the manner of the climbing of vines, by twining, tendrils, rootlets, twisting leaf-stalks or reflexed prickles; the kind of support needed for vines, — stone, wood, or trellis of wire or cord; the

making of poles for the beans, and trellises for the morning-glory vines and nasturtiums in the schoolroom window-boxes ; shrubs, and their value for hedge or flowers or fruits or winter-berries for the birds ; flowers and their value for beautifying the yard or gathering for the house. In the third grade it is possible to teach the elements of landscape-gardening, and to arouse an interest in the subject that I venture to predict will never be lost. The coming generation will not leave the monopoly of beautiful grounds to the rich or to the comparatively well-to-do.

A middle-aged professional man whose boyhood was spent on a beautiful farm, and one who well understands the principles of growing things said to me plaintively on recently taking possession of a new home with ample grounds : "I cannot afford to have a landscape gardener plan these grounds for me. Besides I want to do it myself, for I enjoy that kind of thing ; but I do not know what shrubs and vines to get, and the more I study into the matter, the more confusing the florists' catalogues become. If I only knew what the things look like when they are growing, I could do it with ease, but I don't know clematis from wistaria. We didn't have all these things when I was a boy." This then is a new and legitimate demand upon education and one that nature-study courses should endeavor to meet.

In the third grade, too, a coöperative vegetable-garden may be planned, plotted on paper (the beginning of maps), planted, and in the fall carried to completion in the fourth grade. As preliminary to this work, some simple soil experiments are helpful. The insects that are beneficial or injurious in the garden, and the friendly toad come naturally into the course during the gardening season.

At the completion of the third grade, the child should be intelligent about the source of such things as enter into his daily life in the way of food, clothing and shelter, provided that those things can be produced in the vicinity of his home. The grains that can be raised, the vegetables, the fruits and nuts both wild and cultivated ; butter, cheese, meats ; honey and all home-produced articles of food ; wool for our clothing, leather for our shoes ; wood for fuel and for building, etc.

The work of the fourth grade supplements that of the third by widening the environmental circle into *Industrial Geography*. Those things that we use daily and that form a part of our very lives as it were, but that cannot be produced or profitably produced "around home" may be studied with a view to a wider knowledge and broader outlook for the child. In the Horace Mann School the children of this grade raise and make a study of flax and cotton; they raise wheat and plant winter-rye; this year, owing to the long dry summer, the peanuts matured as well as the cotton and tobacco. By means of pictures combined with specimens, it is possible to learn how bananas and pineapples grow; how cocoanuts are adapted for floating and Brazil-nuts for rolling; to know something of how and where all the fruits and nuts grow, also tea, coffee, sugar, the various spices, and rubber. A slash in the stem of a rubber-tree gives a child an affection for his rubbers that he never experienced before. The arrangement of all these things and more, with pictures and photographs upon three shelves in the front of the schoolroom, illustrative of the cold, the temperate and the hot belts, is not only delightful; it is most instructive.

As regards the industry of lumbering, something is learned of the trees that are of value for lumber, but this subject is for the most part reserved for the forestry work of the fifth grade.

In the line of fisheries, there is new and exhaustless material both from fresh and from salt water; the clam and oyster (and the star-fish), the big French snails that make "good pets," the lobster with the craw-fish for a delegate, and a more detailed study of the fishes in aquaria.

In mining and quarrying there is a series of valuable lessons on building materials and the metals in common use, all of which can be easily and amply illustrated.

The fifth grade in the Horace Mann School makes a very creditable study of trees and birds. The study of trees includes the recognition of twenty-five or thirty of the most common trees of the parks, with preservation of the leaf, twig or fruit in a portfolio; the study of the tree as a plant and the functions of its various parts, involving simple experiments in plant physiology

to illustrate absorption, transpiration, nutrition and photo-synthesis; the study of the forest as a unit and some of its problems, such as injurious insects, fungi, storms and fires; questions of reforestation, and the planting of acorns in the fall, with a transplanting of the seedlings in the spring to home or country residence.

Birds are a source of never-failing interest and the subject quite naturally links itself to the work on trees in the fifth grade.

In the sixth grade of the Horace Mann School the nature-study is wholly physical; in the seventh, there is at present no place assigned to it in the curriculum. We hope, however, at an early date to insert some work on the sea-anemone and coral with a view to making clear the formation of coral islands; and with lantern-slides to arrange a short course in geographical botany, showing desert-plants with their ecological adaptations; trees, plants, and scenes characteristic of the different zones; the change in the vegetation of a mountain from base to summit; and forests of different types. This should to some degree unify the earth for the seventh grade boys and girls. At the mention of the name of a continent they should be able to form a different concept from that of a certain outline filled in with pink, and blue, and yellow.

In the eighth grade of the same school, which is the beginning of the five-year course of the high school, the facts and principles of nature-study are gathered up, together with new material, in which the frog plays a part, and are applied to human physiology. Yeasts and bacteria enter into the work of this year, and although these subjects are up-hill work for a time, they are worth while in the end.

This then is the present trend in nature-study — to be able to give a reason for the faith that is in you for presenting every subject that you bring before the children; and to speak no idle word; to set the children at work doing things — planting bulbs, making flower-beds, setting out vines, shrubbery and trees at school, at home and abroad; to keep pets and to take care of them; to set up aquaria for fish and tadpoles and all manner of swimming things; to encourage them to make bird-houses and

gather the birds about their country-homes ; to make the best of city-life by making the most of our beautiful parks ; to take a pride in those same parks that will keep one's feet off the grass where it is thin and one's fingers from the blossoming shrub ; to make wide the narrow home because every article that enters into it has its own interest, and can lead the thought over all the earth.

This organization of everyday nature-study material, according to the natural development of the child and his environment, is certainly not a scientific organization ; utilitarian is too narrow a word ; commercial is to be ignored ; practical perhaps expresses it ; pragmatic is newer, and more fashionable ; but for the present let us regard it simply as an attempt at the *educational* organization of nature-study.

MARY PERLE ANDERSON.

THE AMES COLLECTION OF CYPRIPEDIUMS.

The large and valuable collection of cypripediums, which formed a part of the collection of orchids given to the Garden in the fall of 1907 by Mr. Oakes Ames, of North Easton, Mass., and to which reference has been made several times in the pages of the JOURNAL, has been flowering freely for the past few months and gives good promise of continuing to do so for some time to come. It is needless to say that this collection is one of the largest and best in the country. It contains in the neighborhood of seven hundred plants, representing about two hundred and twenty-five kinds, among which are about twenty of the original species ; the greater part of the collection, however, is made up of hybrids, of which there are many beautiful and striking forms. Many of these plants are located in house no. 15 of the public conservatories, arranged on the north and center benches of that house. Here have been brought together about four hundred and fifty plants, representing in the neighborhood of one hundred and eighty kinds. The remainder of the collection, made up for the most part of the smaller individuals, is at the propagating houses.

Before proceeding to a consideration of certain individuals of

this collection, a word with reference to their classification may not be out of place. While these plants are commonly known to horticulturists and many others as all belonging to the genus *Cypripedium*, and have generally received the collective name of "cypripediums," they are divided by botanists into four genera, two of which, *Paphiopedilum* and *Phragmipedium*, concern us particularly at the present moment. The distinguishing characters of these genera may be readily appreciated by even the casual observer. Orchids, belonging to the large division of monocotyledonous or endogenous plants, follow the general rule among these plants, having the perianth or floral envelope composed of six parts, three outer, the sepals, and three inner, the petals. In the cypripediums there are apparently but two sepals, two of them, known as the lateral sepals, being united into one organ, which is found immediately below the lip. The dorsal sepal, sometimes known as the standard, is directly opposite this, and is usually a very showy part of the flower. The petals comprise two strap-shaped, lanceolate or linear, sometimes long, tail-like organs, and the highly specialized third petal, known as the lip or slipper, a sac-like organ, with an opening on the upper side. It is in the margin of this opening that the general observer will find the readiest means of differentiating between the genera *Paphiopedilum* and *Phragmipedium*. In the former this margin is sharp, with no infolded rim, while in the latter there is a broad infolded portion. Moreover, in *Paphiopedilum* there is usually but a single flower on the short naked stem, very rarely more, while in the other genus the stem is usually elongated, often provided with numerous bracts, and the flowers are several, sometimes many. A visit to the collection will help fix these characters in the mind, for there are many examples in flower of each genus, so that the differences may be studied in the living plants. These more apparent characters are reinforced by other technical ones of even more weight with the botanist. It is of additional interest to note that all of the plants which inhabit the old world tropics, in Asia, the Malay Archipelago and Peninsula, and the Philippines, belong to *Paphiopedilum*, while those which claim the new world as their home,

being abundant in tropical continental America, belong to *Phragmipedium*.

The leaves in both of these genera are strap-shaped, thick, fleshy, and narrow. This character serves at once to distinguish them from the two other genera, *Cypripedium* and *Selenipedium*, completing the group of four already referred to. In these latter the leaves are broad, thin, and many-nerved, a character by which they may be readily separated from *Paphiopedilum* and *Phragmipedium*. In this latter group of two the perianth falls off early, while in *Cypripedium* and *Selenipedium* the perianth is persistent, remaining in a withered condition upon the developing seed-vessels. To *Cypripedium* belong all the plants of our woods and swamps which we know as ladies'-slippers or moccasin-flowers. The remaining genus, *Selenipedium*, is a native of northern South America. It is very rare in cultivation, and is represented by only three species.

The interesting forms in this collection are so numerous that it would be impossible to designate them all. Some of those which have flowered recently or are now in flower are referred to below.

In *Paphiopedilum insigne*, one of the early introductions from the Himalayan region, we have a charming orchid, quite variable in its color scheme, the various color-forms apparently being of local distribution. Mr. Ames has brought together a choice collection of these varieties, among them being: Dorothy, Chantinii, Laura Kimball, Sanderianum, Harefield Hall, and Sanderae. The last, perhaps, is the most striking of them all, the whole flower being of a beautiful primrose-yellow, with the exception of the upper part of the dorsal sepal, which is a pure white, with a few minute brown dots at its base. This has been used in conjunction with another Himalayan orchid, *Paphiopedilum Pitcherianum*, in the production of an exquisite little hybrid, several plants of which came from Mr. Ames labeled: "*Spicerianum* × *insigne Sanderae*." These vary considerably in shades and markings, but all of them are free-flowering and good growers, the flowers being large and of clear color. One of these plants is especially noteworthy, having a large, pure white dorsal sepal,

with but little green at the base and a few small spots, the petals being a clear yellow, the lip of a similar color, a little flushed with purple, and the shield light yellow with a brilliant orange spot.

Paphiopedilum Spicerianum has been one of the parents in a number of noteworthy hybrids represented in this collection. One of the best of these is *P. Pitcherianum*, the other parent being *P. Harrisianum superbum*, the standard showing clearly its *Spicerianum* ancestry. Another of these is *P. Lathamianum*, the *Spicerianum* element standing out markedly again in the dorsal sepal, its other parent, *P. villosum*, appearing in other characteristics. Another with this common parent is *P. memoria-Moensii*, the other factor being *P. oenanthe superbum*. It is interesting to note the modifications produced by injecting different factors in hybridizing with some one species.

Paphiopedilum melanophthalmum, a hybrid between *P. barbatum* and *P. venustum*, both of which are in the collection, is of a deep claret color, the leaves dark green with a rich purple under surface, a character derived from *venustum*.

Paphiopedilum Rothschildianum, from New Guinea, and *P. Lawrenceanum*, from Borneo, are both in the collection. The former is an unusually vigorous species for the genus, and out of the ordinary in having 2–5 flowers on the scape; its strong, striking foliage and the large flower command attention at once. The dorsal sepal is creamy white, marked with nearly black longitudinal stripes, the petals are horizontal, of a yellowish green with dark blotches and lines, and the lip a reddish brown. *P. Lawrenceanum*, of which many plants will be found in the collection, has beautifully tessellated leaves, the markings being light green upon a dark background. Its large flowers have the dorsal sepal white with pure red veins, and the petals are of a greenish color shaded with purple, especially at the tips and margins. An interesting hybrid between these two is *Paphiopedilum Mahlerae*, which will also be found in the collection, with markings intermediate between the parents.

Perhaps one of the most valuable and remarkable plants is *Paphiopedilum Gandianum*, a hybrid of *P. Curtisii*, a species

native in Sumatra, and *P. Harrisianum superbum*, itself a hybrid between *P. barbatum* and *P. villosum.* The flower is large and deep black-purple in color, the petals long-ciliate and with deeper spots of the ground color, and the dorsal sepal is green with white margins and purple stripes. The foliage is also remarkable in its breadth and heavy texture. It is interesting to compare this plant with *Paphiopedilum Pitcherianum*, referred to above, in which there is one parent in common, and note how the exceptional element in each case has modified the common factor.

Paphiopedilum Prewettii, a hybrid between *P. Harrisianum*, itself a hybrid, and *P. villosum*, a species from Moulmein, should be compared with some of the above in which *P. Harrisianum* is a factor. This is also true of *P. Ledouxiae*, a hybrid of *P. callosum* and *P. Harrisianum*.. Another hybrid in which *P. Harrisianum* is one parent, is *P. Donatianum*, the other parent being *P. insigne Wiottii.*

Paphiopedilum Frau Ida Brandt, a hybrid betweeen *P. Io grande* and *P. Youngianum*, is another of the strong growers of this genus, sometimes bearing three flowers on the stem. The dorsal sepal is a pea-green at the base, fading into pink and white, the margin being marked with brown spots. The petals are drooping, ciliate, the color green shaded into rose, variegated with purple spots. *P. Morganiae* is another hybrid; the dorsal sepal is white, banded with purple, and the lip rose, with darker venation.

In the genus *Phragmipedium* hybrids have also been made. As an example of this, *P. Uranus*, a cross between *P. Lindleyanum* and *P. grande*, may be cited. A beautiful hybrid was produced from *P. Boissierianum*, from Peru, and *P. Schlimii albiflorum*, from Colombia, the result being a dainty white flower delicately flushed with rose; this bears the name of *Cleola. Phragmipedium Hardyanum* is an example of the type with the petals extended into long tails. It is a hybrid between *P. caudatum*, a native of Central America, and *P. Ainsworthii.*

It would be possible to give many other examples in this rich collection, pointing out the modifying influences of the different

factors in varying combinations. Enough has been said to indicate how interesting this collection is and how well one would be repaid by visiting it, not only once, but many times, and studying its various elements as they appear from time to time. The hybrid and its parents are often in flower at the same time, and may often be studied side by side.

GEORGE V. NASH.

AN IMPORTANT COLLECTION OF VARNISH-RESINS.

During the year 1908, the Garden received from Mr. A. P. Bjerregaard the gift of a collection of varnish-resins numbering upward of 212 specimens. It was hoped to get the collection classified botanically, as well as commercially, before directing the attention of the public to it. The task has been found exceedingly difficult, and it is doubtful if the present state of our knowledge will permit of the reference of some of the varieties to their botanical origin.

Mr. Bjerregaard has studied the specimens with great care as to their physical and chemical properties, and their present classification is that which he has based on these studies.

The collection includes many specimens each of amber and other fossil resins, African and American animis, African and American copals, kauris from many parts of the world, and a number of soft and recent resins and miscellaneous substances. The collection as a whole is one of the greatest interest and of great value. It may be seen in a case in the central portion of the west wing of the museum.

H. H. RUSBY.

CONFERENCE NOTES.

The regular conference of the scientific staff and students of the Garden met in the library on the afternoon of February 3, at which time the following programme was rendered.

Dr. Arthur Hollick discussed at some length D. P. Penhallow's "Tertiary Plants of British Columbia," issued in 1908 by the

Geological Survey Branch of the Canada Department of Mines. Attention was especially called to the puzzling arrangement of the text, the innumerable errors of typography and punctuation and the peculiar methods adopted throughout for citation and nomenclature.

Mr. C. A. Darling presented a paper on "Sex in Dioecious Plants," those plants in which the male and female flowers are borne on different individuals. Heredity, the transmission of characters from parent to offspring, is one of the fundamental problems of biology. The determination of sex as now viewed may be considered a phenomenon of heredity. Until within the last few years it was generally believed that sex was determined in large measure, at least, by external factors; however, more recent observations and experiments tend to show that sex in strictly dioecious forms is not determined by surrounding conditions, but that it is predetermined in the germ cells. The excellent work of the Marchals upon dioecious mosses has shown that in the spore-cases of the moss two kinds of spores are formed; upon germination, half of the spores will produce only male plants and half only female plants. Correns working upon some of the dioecious flowering plants has found that two kinds of pollen spores exist; one half of the spores possessing the male tendency, the other half the female tendency. Noll has independently arrived at the same conclusion in his work upon dioecious hemp.

So far as is known, up to this time nothing has been published on the behavior of the chromatin (one of the microscopic elements of the plant cell) in dioecious plants. In working upon the formation of the pollen-spores in box-elder (*Acer Negundo*) which is strictly dioecious two kinds of chromosomes (bodies which result from the separation of the chromatin into a definite number of parts) are found which are formed in different ways. Considering all that has been done upon dioecious plants it seems probable that there is a separation of the two sets of sex characters in the formation of the spores in mosses; and that in dioecious flowering plants the spore-bearing plant normally contains both sex characters but that one set is latent while the other is

dominant and that the latency or dominancy is determined by two kinds of pollen-spores. It also seems probable that the chromosomes which have to do with the determination of sex are formed differently than the ordinary ones. These papers were fully discussed by the various members present at the conference meeting.

At the close of the regular programme Dr. N. L. Britton exhibited a specimen of cotton (*Gossypium hirsutum* L.) collected in Jamaica. Also two specimens of bromeliads were shown which have been associated in the same genus but which are quite different in size and general appearance.

FRED. J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. Marie C. Stopes, of the Manchester University, visited the Garden last month on her return to England from Japan. One of the special objects of Miss Stopes' visit was to see the cretaceous lignitic material from Kreischerville, Staten Island, upon which the recent investigations by Dr. Arthur Hollick and Dr. E. C. Jeffrey were based, which have aroused considerable interest abroad, especially in France and England.

A Darwin Memorial Celebration of the New York Academy of Sciences was held at the American Museum of Natural History, February 12, the one hundredth anniversary of Darwin's birth. A bust of Darwin was presented to the museum by the academy, Mr. Charles F. Cox, president of the Academy, making the presentation address. Other addresses were made as follows: John James Stevenson, "Darwin and Geology"; Nathaniel Lord Britton, "Darwin and Botany"; Hermon Carey Bumpus, "Darwin and Zoölogy."

The Darwin Memorial Exhibition, consisting of letters, writings and portraits of Charles Robert Darwin, and exhibits demonstrating various aspects of the process of evolution of the human species, of other animals and of plants, with special reference to the Darwinian Principle of Natural Selection, will continue until March 12.

The application of Darwinian principles to plants is illustrated in the following manner :

Variaiion under domestication by races of Indian corn ; races of daffodils.

Variation in nature by races and closely-related species of American thorn trees.

Struggle for existence by the water hyacinth, a plant which has been introduced into Florida, a new habitat, where it has multiplied at such a rate as to choke the streams ; a demonstration of the struggle for existence of young plants grown from seeds planted in areas that overlap ; photographs of the conditions in forests, where low shrubbery is prevented from growing because of the lack of light in the shade of the large trees.

Hybridism by specimens of hybrid ferns, oaks, verbenas and *Valerianodes*, together with their parents.

The fossil record by a series of specimens of fossil plants showing the succession of their appearance upon the earth.

Geographical distribution by specimens of the larger fungi as examples of invariable circumboreal and circumtropical plants.

Principles of classification by living specimens of cactus plants.

Principles of homology by specimens illustrating the different forms of leaves of the ferns and their relatives.

Rudimentary and vestigial organs by a prickly-pear cactus and a New Zealand bramble showing reduced leaves.

Insect-eating plants and climbing plants by displaying two different kinds of adaptations — one in respect to nutrition, and the other in respect to the development of structures to afford mechanical support.

Fertilization in plants by charts demonstrating the peculiar nature of the process of fertilization, and the special mechanisms that these organisms have developed to bring about fertilization in various ways. The processes are adjusted intimately to the visits made by insects to flowers for nourishment.

Meteorology for February. — The total precipitation recorded at the Garden for February was 4.56 inches. Maximum temperatures were recorded of 58.5° on the 6th, 58° between the 8th and 15th (thermograph failed to record exact date), 56° on

the 19th, and 54.5° on the 22d. Also minimum temperatures were recorded of 8° on the 2d, 22.5° between the 8th and 15th (exact date lost as above), 28° on the 18th, and 18.3° on the 26th. The mean temperature for the month was 33.25°.

The precipitation for the month was 4.56 inches, and consisted almost entirely of rain, with a light snow fall on the 3d and flurries on the 9th, 11th, and 28th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

329 herbarium specimens from North and South America. (By exchange with the University of Copenhagen.)

240 specimens, "Glumacées de Belgique." (Distributed by Professor Cogniaux & Marchal.)

1 specimen of *Lophozia longiflora* from New Hampshire. (Given by Miss Annie Lorenz.)

2 specimens of mosses from Providence, Rhode Island. (By exchange with Mrs. B. J. Handy.)

14 specimens of *Crataegus* from the northeastern United States. (Given by Mr. R. C. Benedict.)

100 specimens, "Fungi Columbiani," Century 27. (Distributed by Mr. E. Bartholomew.)

21 specimens of sedges and grasses from Staten Island, New York. (Given by Dr. Arthur Hollick.)

9 specimens of hepatics and mosses from Monteer, Missouri. (Distributed by Mr. B. F. Bush.)

50 specimens of large woody fungi from northern Europe. (By exchange with the University of Copenhagen.)

100 specimens of woody fungi from Connecticut and West Virginia. (By exchange with Professor John L. Sheldon.)

3,300 specimens of fungi from Jamaica. (Collected by Dr. and Mrs. W. A. Murrill.)

50 specimens of woody fungi from New York and Indiana. (By exchange with Professor J. Van Hook.)

41 specimens of hepatics from Central America and Mexico. (Distributed by Dr. E. Levier.)

71 specimens of *Crataegus* from Rochester, New York. (By exchange with Mr. C. C. Laney.)

16 specimens of *Crataegus* from Denver, Colorado. (By exchange with Professor E. Bethel.)

30 specimens of *Crataegus* from Iowa and Montana. (Given by Mr. B. T. Butler.)

8 specimens of *Crataegus* from Nantucket, Massachusetts and Long Island, New York. (Given by Mr. E. P. Bicknell.)

4 specimens of *Crataegus* from New York. (By exchange with Dr. H. D. House.)

7 specimens of *Crataegus* from Virginia. (By exchange with the United States National Museum.)

127 specimens of mosses from Central America. (Distributed by Dr. E. Levier.)

306 specimens of *Crataegus* from the southern United States. (Collected by Mr. W. W. Eggleston.)

PLANTS AND SEEDS.

5 orchids for conservatories. (By exchange with Mr. J. A. Manda.)

33 plants from Cuba, for conservatories. (Collected by Dr. J. A. Shafer.)

2 plants from the Everglades, Fla., for conservatories. (Collected by Dr. J. K. Small.)

100 plants from northern China, for nursery. (By exchange with Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.)

8 cacti from Key Largo, Florida, for conservatories. (Collected by Dr. J. K. Small.)

1 plant of *Opuntia arizonica* from Arizona, for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

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The New York Botanical Garden

EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

OF

The New York Botanical Garden

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THE FERN COLLECTIONS OF THE NEW YORK BOTANICAL GARDEN.

Ferns are to be found in practically every department of the Garden collections. They have their largest representation in the systematic collections, but are found also in considerable numbers in the palaeobotanical department, in the living collections, and to some extent in the economic collections.

The economic uses to which ferns are put, to take them up in an order inverse to that just noted, may almost be counted on the fingers of one's hand. A few species are used as food in various parts of the world, particularly the leaves of certain succulent kinds. *Pteridium aquilinum*, a cosmopolitan species, is one of these. The young, unrolling leaves are prepared and eaten like asparagus. A few other kinds have medicinal uses. The rhizomes of the male-fern, *Dryopteris Filix-mas*, are so used. Specimens of this fern may be seen in the drug collection and in the economic garden. One of the lycopods, *Lycopodium clavatum*, is also used as a drug. A further use for lycopods is found for the copious spores of certain species which are used in some kinds of fireworks. In the south side of the middle case of the fiber collection may be seen a bundle of the slender leaf-stalks of a Javan species of *Dicranopteris*, together with brown fibers taken from the leaf-stalks, and various articles of native manufacture in which these are used. The fibrous, black root-masses of certain of the osmundas and some tree-ferns are extensively used, sometimes under the misnomer "peat," for the growing of orchids and other epiphytic plants.

Besides these limited uses, ferns, and lycopods as well, are also used largely for decorative purposes. Every autumn bands of Italians establish camps in the mountainous regions along the Housatonic and elsewhere, and gather huge baskets full of the Christmas fern, *Polystichum acrostichoides*, and the evergreen spinulose fern, *Dryopteris intermedia*, together with shoots of laurel. These are packed in bales and are later shipped to New York and other cities to be used with cut flowers. Living specimens of these species may be seen in the fern-bed at the south side of the herbaceous grounds.

This brings us to the collections of cultivated ferns, among which are numerous species of horticultural value. It is as living plants, undoubtedly, that ferns find their largest commercial use.

The cultivated ferns at the Garden are comprised in two collections, the hardy outdoor species and the tender conservatory species. Most of the hardy ferns are in two beds, located, as noted above, at the south end of the herbaceous grounds, and comprising forty to fifty species. The larger bed includes also a thriving colony of *Polypodium vulgare*, one of the twelve or fifteen species native in the Garden. Recently, also, a bed has been established at the east side of the Garden, in which introduced species are tested for hardiness, and plants requiring study are grown under the most favorable conditions. Plants of a number of recently described and older *Dryopteris* hybrids have also been placed here, and it is hoped to make this collection as complete as possible, since fern hybrids constitute a class of plants which are best preserved under cultivation.

The propagating houses in the same region contain a considerable number of ferns, including plants sent over from the larger range to recuperate, many young plants not yet large enough for the public houses, and a case of filmy-ferns, representing all the plants of this family in cultivation at the Garden. This collection is of value not only on account of the interest which attaches to this peculiar order of ferns, but because, as they have been grown, they have served as a sort of nursery for many other kinds.

The plants comprising this collection were shipped from

Jamaica just as they were found, on pieces of rotten logs, and mixed with various sorts of mosses, some of which are more conspicuous than the associated "filmies" themselves. Included with these mosses and filmy-ferns were numerous spores of other kinds of ferns. Young plants have been constantly springing up, self-sown in the Jamaican woods, but coming to germination only after the material had reached the Garden. As these

FIG. 11. Evergreen spinulose fern, *Dryopteris intermedia*.

reach sufficient size they are picked out, and, if of interest, potted and grown to maturity. In this way a considerable number of species, new to the garden collection, have been added in the last two or three years and more new ones continue to appear.

But aside from the filmy-ferns, the large public conservatories contain the most complete collection of living ferns to be found at the Garden. Several hundred species are represented here, located principally in houses No. 10 and No. 11. A few requiring cooler winter temperature are kept in house No. 12, and a few

others, water-ferns, are grown in the aquatic house, No. 9. Probably the largest number of species are to be found in house No. 10, where the plants are arranged along the benches in taxonomic sequence. But the plants in No. 11 are of rather more general interest. In this house are to be found ferns of the greatest variety of habit and appearance, from simple-leaved unfern-like species of *Asplenium*, *Doryopteris* and others, to tree-ferns with tall trunks and leaves many times divided; from the bizarre, well-named "staghorn" ferns to the Lygodiums, ferns whose leaves may climb to a height of ten feet or more. Not the least interesting are the plants of the Marattia alliance, a group of ferns whose ancestors can be traced back in geological history to the coal-measures, strata whose age is variously estimated up to fifty millions of years.

Fossil specimens of these ancestral forms and of other types of ancient fern-plants are to be found in the palaeobotanical collections in the basement of the museum building. Study of fossil-ferns is becoming increasingly important nowadays, as it is generally accepted that somewhere in this alliance there exist the ancestral forms of all our modern vascular plants with the exception of the lycopods and horsetails. These last mentioned groups, although commonly designated as "fern allies," are really less closely related to ferns than are the cycads, the conifers and probably also the dominant modern group, the flowering plants. In coal-measure times, plants of the lycopod alliance formed the dominant type of vegetation, including great tree-like species of "horsetails" and "lycopods," 100 feet high and more, some of which had developed the seed-bearing habit. Impressions of the trunks and leaves of some of these plants are also to be seen in the collection of fossil plants.

The remaining fern collections of the Garden are comprised in the systematic collections on the second and third floors of the building. On the second floor, ferns occupy their proportionate share of the series of public exhibits, and are found in the microscope exhibit, in which a few of the characteristic features of fern anatomy are shown, in the general display herbarium, and in the local flora stands, the last-named containing forty-three species.

The most valuable of all the fern collections at the Garden and, from a scientific standpoint, the most important, is the general working herbarium, located on the top floor, where it occupies sixteen cases in the long east-and-west laboratory, east of the library. Since January, 1908, the fern herbarium by vote of the Scientific Directors has been officially known as the "Underwood Fern Herbarium," and recently a bronze tablet bearing this name has been put in place on one of the cases.

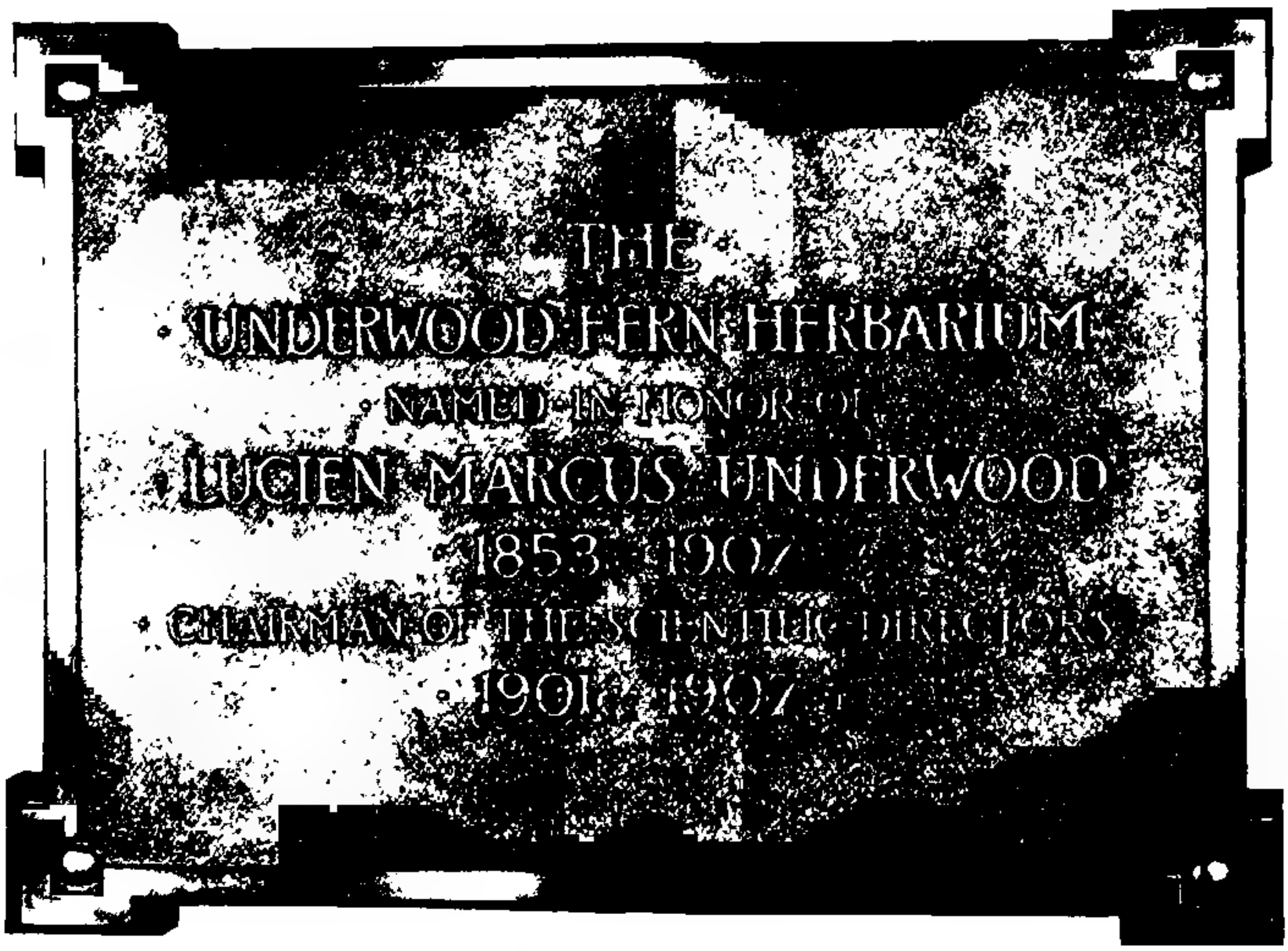

FIG. 12. Bronze tablet recently installed in the Underwood Fern Herbarium.

The herbarium contains a total of about 16,000 specimens. The greater part of these are North American species, of which the Garden probably has the most comprehensive representation in any herbarium. The collection was built up under the direction of the late Professor L. M. Underwood, after whom it is named, and it owes its present efficiency as a working herbarium almost entirely to his efforts. Its efficiency is due not only to the large amount of recently collected material which it contains but in a very considerable degree to the fragments of older collections, often scraps of type material, which were obtained

through the courtesy of the curators of various European herbaria.

Professor Underwood always insisted on the necessity of the study of type material in connection with revisionary work, and he probably did more in the line of "international" study than any other botanist has done.

But in addition to North American material, the fern herbarium contains a considerable collection from other regions, notably South America. The flora of the northern part of that continent is particularly important in connection with the preparation of North American Flora, as many species are common to the tropics of both regions, and the real relationships of some of these can be determined only by studying them throughout their ranges. Through the collections of H. H. Smith, R. S. Williams, H. H. Rusby, and Miguel Bang, together with parts of earlier collections, the Garden has now a fair representation of the ferns of northern South America.

The Old-World ferns are of course not nearly as well represented. At present they are divided into four collections. Two of these, the Hawaiian ferns and the Japanese ferns, are being studied by Miss W. J. Robinson and Miss M. P. Anderson respectively, in connection with graduate work at Columbia. A third set of Philippine ferns has been partly identified but awaits a student who will take them up thoroughly, making use of the large amount of recent literature on the ferns of this region, principally by Dr. E. B. Copeland and Dr. Hermann Christ. The material consists principally of a splendid set of Mr. Williams' collection, but includes also a considerable amount obtained from the Government botanists and a few numbers of older collectors.

The remaining Old-World material is included in the general fern herbarium and consists principally of scattered collections. One set, however, should be noted, that of Chinese ferns purchased of Augustine Henry. The territory in which he collected has proved to be remarkably rich in undescribed species, and although a number of European botanists have worked with other sets of his plants, there are undoubtedly many novelties yet to be distinguished.

In general, the fern herbarium stands in need of careful study of two sorts: first, to arrange it in accord with the best results of recent research, and second, to extend still further our knowledge of these plants by original work. There is scarcely a genus of ferns which does not need monographic study. Professor Underwood had made a start at this in connection with North American Flora work, and had published results for a number of genera. He left also considerable manuscript, on other groups, some of which is being completed to appear in part 1 of Volume 16 of North American Flora. But the groups he had been able to work with most, occupy less than two of the sixteen cases, so it may be seen that the greater part of this work remains to be done.

Attention should also be paid to the collections of living ferns, as these can be made of considerable value both from a scientific and from a popular standpoint. The collections of filmy-ferns and of fern hybrids in particular have already furnished material for study. Recently the conservatory specimens of *Cyathea arborea*, a large Jamaican tree-fern, served to clear up a doubtful point in connection with North America Flora work.

The value of ferns from the horticultural point of view has already been referred to. Ferns out-of-doors do well in situations not favorable to most flowering plants and, if properly established and arranged, will be attractive from early spring to late fall. The indoor collection forms already one of the most attractive exhibits in the whole conservatory, and should improve when transferred to the more favorable conditions to be had in the new conservatories. The larger space will also allow a better display, as they are at present rather crowded.

RALPH CURTISS BENEDICT.

EXPERIMENTS ON THE EFFECT OF THE SOIL OF THE HEMLOCK GROVE OF THE NEW YORK BOTANICAL GARDEN UPON SEEDLINGS.

The slow growth of the forest tree, the uncertainty of the amount and vitality of the seed crop, the lack of knowledge of

the relations between the character of the soil and the vigorous development of the seedling make the raising of the sapling of sufficient size for planting a matter of great importance.

In the New York Botanical Garden the hemlock grove is not only a feature of great natural beauty but of much scientific interest. It occupies about thirty-five or forty acres along the banks of the Bronx River, and is the largest stand of hemlock to

FIG. 13. Opening in hemlock grove where young hemlocks are developing owing to the favorable light relation. Photographed by Prof. C. C. Curtis.

be found so far south, near the Atlantic seaboard. A large part of it is primeval forest, for it has been protected for many years by the former owners, the Lorillard family. The soil is a thin layer of humus and disintegrated rock overlying the gneiss and schist of the formation of this locality. The roots of the hemlock spread near the surface of this thin soil so that much damage is often done by a heavy wind, which may overturn trees

whose development has occupied hundreds of years. The area is not entirely covered by hemlock but has numerous openings where deciduous trees and shrubs grow. Among these, hemlock seedlings are seen in considerable numbers but the floor beneath the hemlock trees is comparatively naked. This bareness of the forest floor is also true of the undisturbed Canadian forests further North. Dr. N. L. Britton called attention to this in an address before the Bronx Society of Arts and Sciences in May, 1905 (Trans. Bronx Soc. of Arts and Sci. 1 : 6. 1906), in which he said : "The shade is too dense for the existence of much low vegetation, and this is also unable to grow at all vigorously in the soil formed largely of the decaying resinous hemlock leaves ; . . . the floor of the forest is characteristically devoid of vegetation. . . . The seeds of many plants growing outside the hemlock forest are yearly transported into it by the wind and by birds but grow very sparingly ; the seeds of the hemlock do little if at all better ; they cannot germinate immediately under the trees which bear them, but species exposed to the light are soon occupied by seedling hemlocks, and it is in this way that the forest is perpetuated."

Prof. F. E. Lloyd (Jour. N. Y. Bot. Gar. **17** : 97. 1900) has described the growth of hemlock seedlings, as he observed them in the New York Botanical Garden. Development begins about the first of May and the growth for the first season is an inch or less. A similar amount of growth for successive seasons brings the height to four or five inches at the end of four years. From the number of seedlings of one year's growth which he found in June, 1900, he inferred that the preceding year had been good for the production of seeds. No seedlings of the previous year, 1898, were found, and only two from the crop of 1897, while there were so many seedlings of four years' growth that it was evident that 1896 was a favorable year for seed production. His conclusions were as follows : "The matter of seed production is variable, depending upon conditions from year to year. It is also to be noted that the hemlock seedlings fail to germinate, or die soon after, unless they are in the proper conditions as to shade and moisture. They thrive best in humus soil, while to

other soil factors they are comparatively indifferent. Too much sun, however, or too much moisture kills them very readily. They are to be found, therefore, on the forest floor and less abundantly about the shaded edges of the forest. They do not appear to be able to compete with grass or other tightly growing herbaceous plants but prefer a clean floor. They grow very readily on rotting woods."

In June, 1906, Professor William J. Gies, Consulting Chemist to the Botanical Gardens, suggested that the series of experiments described in this paper be undertaken to determine whether any chemical constituent of the soil in the hemlock grove was the detrimental factor causing the failure of the hemlock seedlings to develop.

Areas shaded by three or four trees each, were marked out and the number of hemlock seedlings that germinated that spring were counted. The number varied from thirteen or fourteen under trees in the interior of the grove, to from sixty to seventy-five under trees near the margin. In an open space of equal area where ash saplings four feet high, red-berried elder, viburnum, and herbaceous plants such as sweet cicely were found, nearly one hundred were noted. One month later only about a fourth of the seedlings remained, and at the end of three months only thirteen seedlings survived in the entire area shaded by hemlocks, while the number beneath the deciduous trees and shrubs nearly equaled that of the first count observed.

June 29, 1906, about one half bushel of surface soil was taken from the hemlock woods near the Lorillard mansion and the same amount from the grove of deciduous trees adjacent. There were no evidences of the work of earthworms or chipmunks under the hemlocks but there were signs of both under the deciduous trees. In contrast with the bareness of the soil beneath the hemlocks, many shrubs and herbaceous plants were found growing under the deciduous trees, including dogwood, sassafras, violets, jack-in-the-pulpit, ashes, viburnums, and young hemlocks.

Soil from each of these localities was ground in a mortar on four successive days and allowed to dry in the intervals. Then a part of each was sifted through sieves and cheese-cloth, and

after further drying at room temperature was preserved in tightly corked bottles. Extracts of this *sifted* soil in distilled water, in proportions varying from two parts to forty parts of soil per hundred of water were made, the water being allowed to remain four days upon the soil at room temperature, with frequent shaking. Similar extracts of *unsifted* soil from the two localities were also prepared. The filtered extracts were placed in chemically clean beakers, 400 c.c. in each. Lupine seeds were soaked in water six hours and then planted in moss. When the hypocotyls had grown to a length of about a centimeter they were marked five millimeters from the tip with India ink. They were then suspended so that their tips were just immersed in the solution. To do this, glass rods were bent into L forms and pointed at their lower ends, which were thrust through the cotyledons of the lupine, while their upper ends were pushed through perforations in a sheet of cork which rested on the top of the beaker.

After an interval of eighteen hours each seedling was removed, the root was gently dried with filter paper and placed upon glass over a ruler, where its length above five millimeters showed the growth for the period it had been in the solution. Measurements were made at intervals of twenty-four hours for four days. Seedlings of corn were used in the same way.

In September, 1906, thirteen hemlock seedlings were placed in a pot containing soil from beneath the hemlocks and the same number were put in a pot containing soil from beneath the deciduous trees. These were left in the propagating house of the New York Botanical Garden. At the end of three months all were alive and in good condition, though scarcely any growth was perceptible. After six months four of the seedlings in the hemlock soil and five in the deciduous woods soil had died. Meantime the pots became choked with moss and liverwort and at the end of a year, September, 1907, only four survived in each pot. After a year and a half three were alive in each. This result, together with the irregularity of the curves that might be plotted from the tabulations given above, indicates that the failure of hemlock seedlings to germinate beneath the adult trees is not due to a special toxic constituent of the soil, but rather to

such ecological factors as the amount of moisture and light, and to the physical condition of the soil caused by the mat of hemlock needles that accumulates beneath the trees.

The following table gives the average growth per hour for each of the solutions :

Date 1906	Sifted or Unsifted Soil.	Seeding.	Hours of Growth.	Grams of Soil Extracted per 100 c.c.	Average Growth per Hour.	
					Hemlock Soil Extracts.	Deciduous Soil Extracts.
Aug. 28	Sifted	Corn	66	2	1.9901 mm.	1.8257 mm.
"	"	"	"	4	1.8674	1.9797
"	"	"	"	8	1.9536	1.7613
"	"	"	"	16	1.6565	1.3287
July 21	"	Lupine	"	2.5	0.7007	0.7045
"	"	"	"	5	0.8030	0.9015
"	"	"	"	10	0.6666	0.8257
"	"	"	"	20	0.7727	0.8143
Aug. 28	"	"	"	2	0.6098	0.5464
"	"	"	"	4	0.7121	0.5075
"	"	"	"	8	0.5719	0.7575
"	"	"	"	16	0.9500	0.7310
" 25	Unsifted	"	"	2.5	0.7803	0.6136
"	"	"	"	5	0.7592	0.7575
"	"	"	"	10	0.7234	0.7811
"	"	"	"	20	0 7766	0.7875
Sept. 6	Sifted	"	"	2.5	0.5075	0.4356
"	"	"	"	5	0.4376	0.5643
"	"	"	"	10	0.6969	0.6250
"	"	"	"	20	0.8068	0.6477
July 21	Check	"	"	Dist. water	0.6477	
Aug. 25	"	"	"	" "	0.4545	
Sept. 6	"	"	"	" "	0.3863	

The results in the table are too obvious in their significance to call for discussion.

Fernow (U. S. Dept. Agr. Div. For. Bul. **5**: 41. 1891) says: "As to adaptability to soil we need consider only the physical condition of the soil, for forest trees require such small amounts of mineral matter that it is questionable whether a soil could be found that does not contain in sufficiency those that seem necessary."

According to Dr. Ebermeyer (Fernow, Garden and Forest **6**: 34. 1893) the air in the forest soil contains less carbonic acid than that of the field, varying from three to four times less in the

winter to five or six times less in the summer. Forest soil encourages sap bacteria and no pathological bacteria are found in it.

Roth (For. Cond. and Int. of Wis. U. S. Dept. Agr. Div. of For. Bul. **16**: 34. 1898) says: "Hemlock has a shallow system of roots, sensitive to the interference in soil moisture, hence furnishes a great quantity of dead and down material. Over wide areas only old trees occur, these often dying out. There is apparently no lack of seed, for the hemlock, like the pine this season (1897), was full of cones, and yet there is very little reproduction of this timber. For miles no young growth is seen, and the small trees, often mistaken for saplings, generally prove to be runts, suppressed individuals, often 150 and more years old. The only places where this tree still seems to hold its own are in some of the wet half swamps of the eastern part of this area. The young hemlock stands a great deal of shading and close crowding, but grows slowly both in height and thickness."

We must look then to the hemlock seedlings which germinate in the open spaces in the grove, where deciduous trees and shrubs shelter them as they develop yet do not form too dense a cover, for the continuance of the hemlock grove.

WINIFRED J. ROBINSON.

SOME EAST INDIAN ECONOMIC PLANTS AND THEIR USES.

Economic plants are those whose products, such as fibers, starches, and sugars, are utilized by mankind. Fibers are obtained from the bark, stems, and leaves of many plants and are made use of in various ways. Of the plants from whose leaves useful fibers are obtained, one of the commonest and most extensively utilized types is the group of the screw-pines, a genus of plants containing over one hundred species, which are confined entirely to the eastern hemisphere, and a dozen or so to the islands of the Malay Archipelago and vicinity. The screw-pines derive their appellation not from any resemblance to the pine-family, but from the spiral growth of their leaves and the similarity of their foliage to that of the pineapple. Some species attain the size of trees, with

branching stems, but the greater majority are more or less bushy. The leaves are often long, rather tough and leathery and frequently armed along the margin and on the midrib of the under surface with numerous sharp, recurved prickles. On some islands large tracts of land are covered with these plants, growing

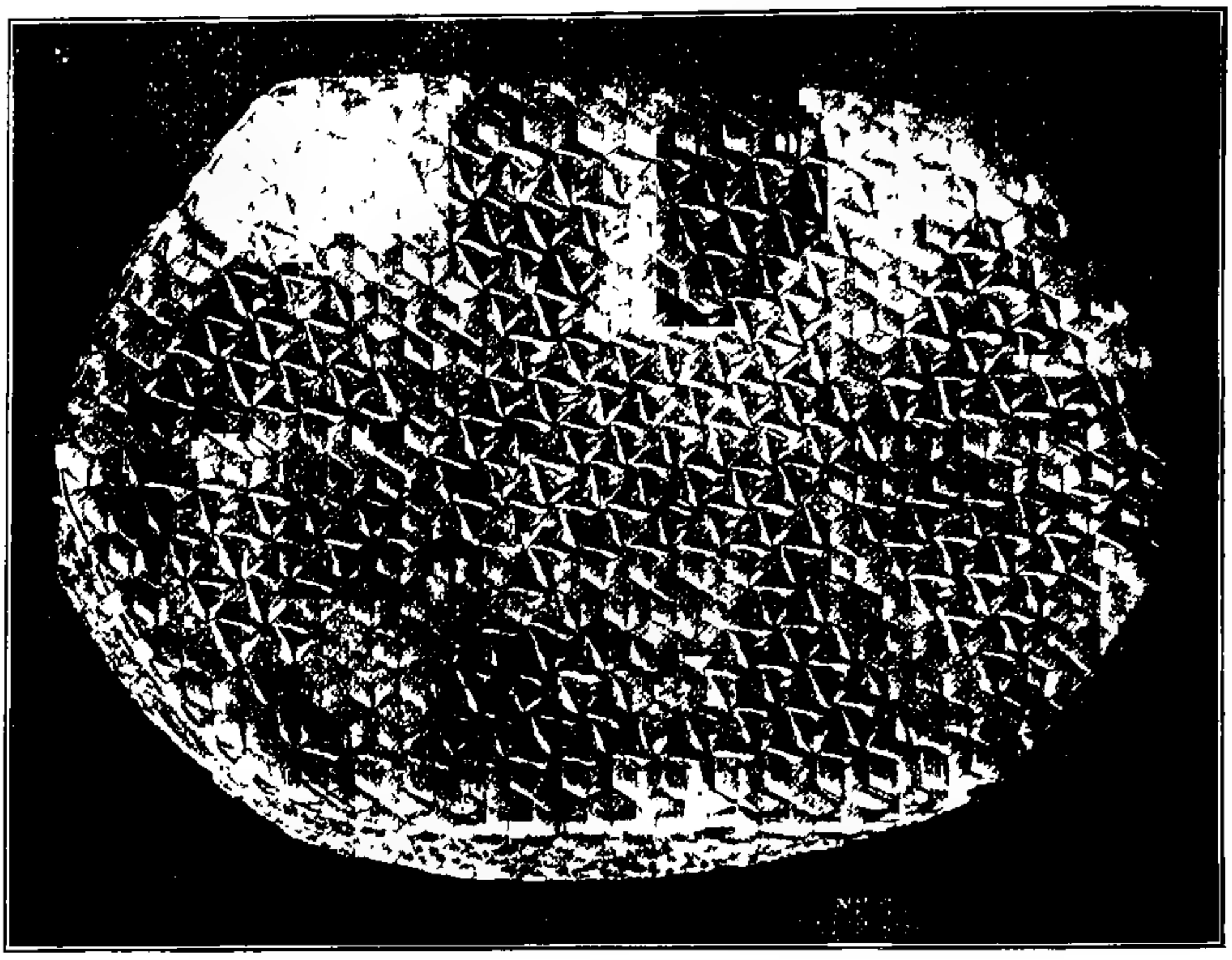

FIG. 14. Fancy basket made from the leaves of the screw-pine.

so close together as to form an almost impenetrable mass of vegetation, while other species are to be found growing singly or few in a group. The leaves and roots of the screw-pine are the two parts commonly utilized. The former are cut in large numbers, tied into bundles and carried by the men to the village, where the prickles from the margins and under surface are removed by the women. Each leaf is first exposed to fire, and is then taken in the left hand and with a sharp, four-bladed knife, held in the right hand, it is cut into strips of a uniform width. After soaking in water for several days, the strips are spread out and bleached in the sun. Upon subjection to this treatment they become flexible and can be wrought into any desirable shape without injury to the fiber.

Two species in particular, "Pandan tikar," the mat screw-pine, and "Pandan Lawut," the sea-shore screw-pine, are considered as yielding the best grade of leaves for mat and basket weaving.

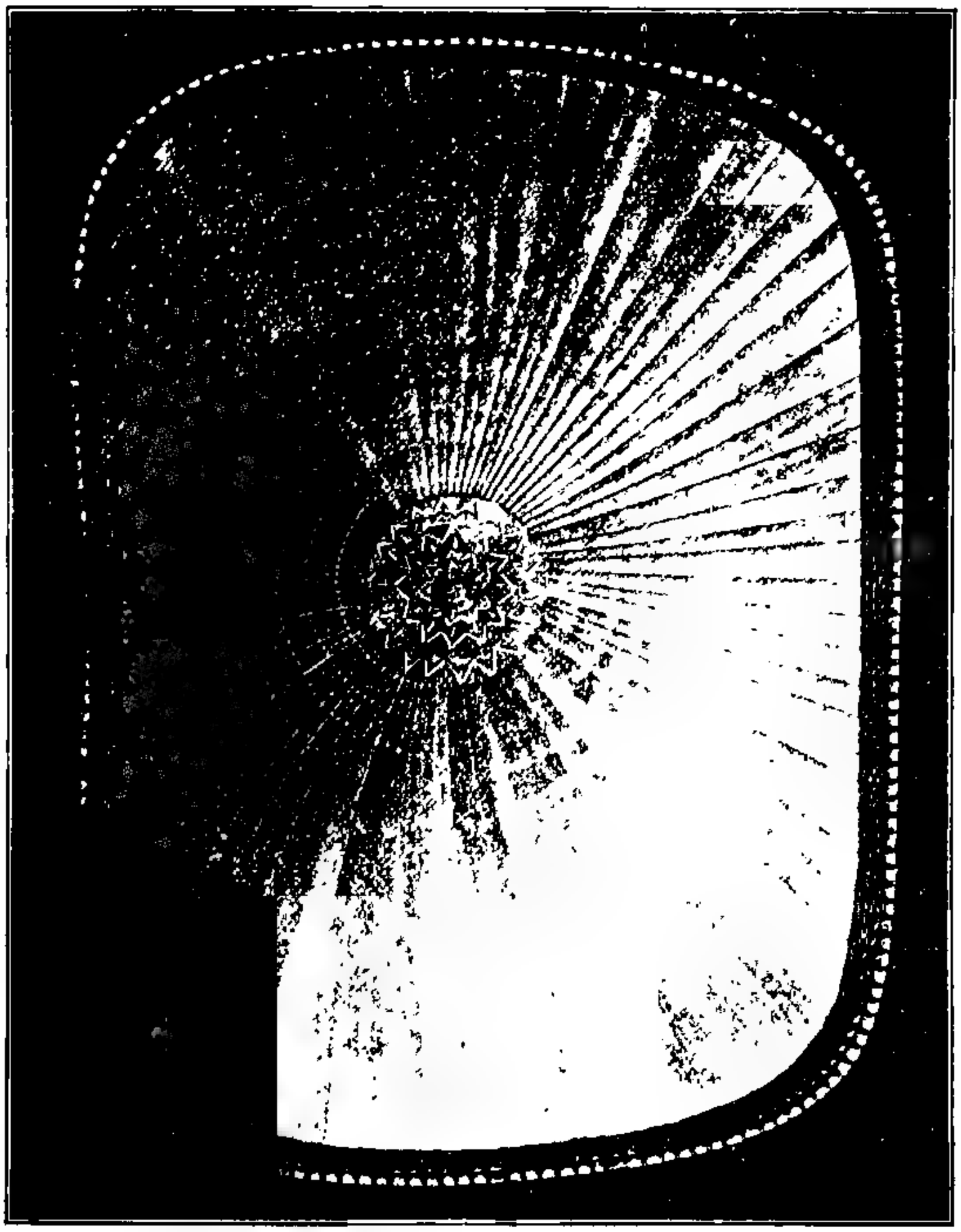

FIG. 15. Hat made from the leaves of the screw-pine. The black fiber on the margin is obtained from fern stems.

Other species, bearing much larger leaves, are regarded as an inferior grade because of their coarseness. By placing the leaves of these species side by side, slightly overlapping and sewing together with a coarse fiber, they are often made into large mats called "Kajangs," which are used in the construction of native houses or serve as a covering for carts.

Coarse sacks made of this fiber, in which various articles of commerce have been shipped, are sometimes found in our markets.

In some sections the thick aërial roots are said to serve as corks. Other leaf-fibers are woven into " Ataps," large shingles, from the leaflets of the " Nipah" (*Nipa fruticans*), a low, stemless palm with large, unarmed leaves common in tidal mud in many sections.

Useful fibers are of rather uncommon occurrence among the spore-bearing plants, but among the ferns there are several species, both of tropical and temperate regions, of which the entire stipe (stem) is utilized. In order to obtain the fiber from some species the stems are cracked, when the outer brittle portion falls away. The central fibrous portion is then scraped with a knife and split into small strips which are sharpened at one end and drawn through holes of diminishing sizes punctured in a piece of a tin. Fibers of this sort are used mostly for hats, which are worn by the Malay men at their various festivals. Fern-fibers are also used by the Hoopa Valley Indians, in northern California. The entire stipe of the maiden-hair fern and the dyed fibers obtained from the stalks of one of the chain-ferns are woven into hats, which are said to be the ordinary head-dress of the squaws.

Palm-fibers are manufactured into many different articles and their usage is common throughout the world. The husk of the cocoanut yields a tough, somewhat elastic fiber which is sometimes made into rope, or more commonly manufactured into door-mats.

The variety of uses to which some of the woody fibers are applied is almost endless. Of these, the bamboo, " Bulu " of the Malays, ranks with the foremost. These plants, the largest of the grasses, sometimes attain a height of over sixty feet with a diameter of three inches or more. The natives of Java use the culms (stems) largely in the construction of their houses. The young shoots are split into thin strips and used as cordage, while the hollow stems serve as pails or conduits for conveying water. The rapid growth together with the smoothness and roundness of the stem make this plant one of nature's most valuable gifts to the natives.

Starches occur in the tubers, fruits, and stems of many plants and are extracted in various ways. Sago, a kind of starch, is a product of several species of palms and palm-like plants, the bulk

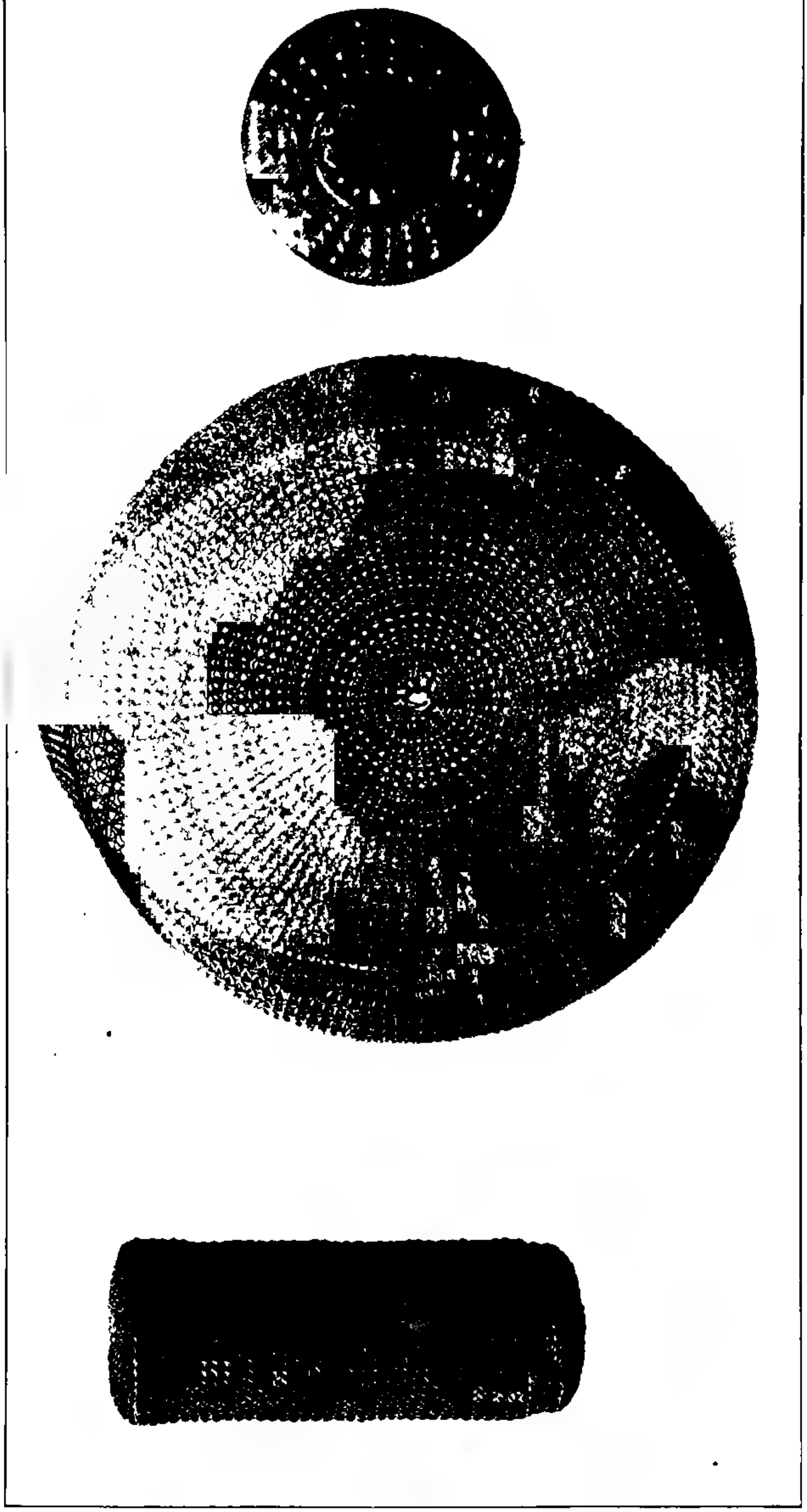

FIG. 16. Cigar-case and hat, made from fern-fibers drawn through holes in the tin instrument shown on the right.

of which is probably derived from the trunk of *Metroxylon Sagu*, the true sago palm, native of many of the islands of the Malay Archipelago and vicinity. This species of palm, which prefers damp places, sometimes attains a height of forty feet, and has a large, comparatively smooth trunk, bearing at the summit a crown of pinnate leaves. In the preparation of sago, a full-grown plant is selected, the palm is felled close to the ground, cut into sections three or four feet in length, and soaked in water for several days, after which the outer fibrous portion is removed. Each section is then ground into sawdust by a coarse grater constructed of two pieces of board in which are driven many small nails filed down to within a quarter of an inch of the wood. The sawdust is then thrown into a large receptacle made of coarse sacking and propped up on poles several feet from the ground. Into this receptacle a native enters and tramps up and down, while an abundance of water is being added. As a result of this treatment the starch sinks and flows out through a small bamboo trough into a vessel below, leaving the woody portion floating behind. After several days the water is drained off and the sago meal dried, when it is put into bags and shipped away for refinement.

Sugar is obtained from the sap of many plants, and is usually extracted by the crushing of their tissues. At the present time sugar-cane is one of the world's chief sources of supply for this product but the sugar-beet is gradually assuming greater relative importance. The sugar-palm (*Arenga saccharifera*) and the cocoa-nut-palm (*Cocos nucifera*) are among the two principal sources of palm-sugar. Just before the opening of the flower-buds the branches of each cluster are bound together, the ends chopped off, and several incisions made on the lateral branches; the end of each cluster is then forced into the mouth of a receptacle made from the stems of the bamboo. In this manner many palms are treated in a single morning. At intervals of twenty-four hours the native returns to the palms, empties the pails of their contents, and, after replacing them, carries the sap away to be boiled down, when it is made into small cakes, wrapped in leaves and sold in the market.

Masticatories are frequently indulged in by both sexes through-

out the Orient. Of these the betel-nut, "Pinang" of the Malays, the chewing of which is a common practice, is one of the best. This palm is cultivated in many places solely for its fruit, and is occasionally found on some of the islands of the West Indies, where it has been introduced and where little is known of its properties. The fruit is about the size of a lime, of an orange color, and has a rather thick, fibrous husk; the seed bears some resemblance to the nutmeg and is removed by cutting away the husk. For chewing, small pieces are cut off, rolled up in a pepper leaf with a little lime and placed between the lower lip and teeth. The constant use of this stimulant imparts a reddish tint to the lips and mouth and blackens the teeth. Among the aged, who have long lost their most important members for masticating, and in a land where artificial teeth are seldom seen, it is a common practice to crush the nut into a powdery mass, when it is chewed with as much vigor as in youth.

PERCY WILSON.

CONFERENCE NOTES.

At the March conference of the scientific staff and students of the Garden, held on March 3, Dr. C. C. Curtis first spoke on the "Flora of the Peribonca River, Quebec," giving an account of a recent trip through that region which is so seldom visited by the white man.

After skirting the shores of Lake St. John in Indian canoes, the Indians refusing to the cross the lake under any conditions for fear of rough water, the party passed into one of the many narrow mouths by means of which the Peribonca River empties into the lake. Here the stream was narrow and unpretentious and after a short trip we camped for the night and the next morning entered the main channel of the stream which stretches out a magnificent river almost a half mile in width. From this time to the end of the trip, a journey of eleven days, it was a constant struggle to plow our way against the swift current where the waters surged and boiled so that the surface was continually disturbed and covered with foam.

The country is hilly and the river in many places is bordered by rocky precipices which in the upper reaches of the stream rise abruptly to a height of 1,500 to 1,700 feet and are often covered with an abundant growth of timber. One of the attractions of the first ten miles of the trip was the thrift of the farmers, mostly of French descent, with their farms of flourishing crops. This was a surprise to us as the soil at first sight appears to be light and unproductive. A close examination reveals the fact that while the top-soil is light it is stratified with layers of clay from which the water seeps. The clay subsoil lies so close to the surface of the ground that it holds a sufficient amount of moisture to supply the needs of the growing vegetation, and makes it possible for the farmers to produce excellent crops.

A study of the timber regions shows a comparatively small number of varieties of deciduous trees, this region being too far north to furnish conditions favorable for this kind of vegetation. The predominating types are the paper birch and aspen; a few yellow birches and slippery elms were noticed along the lower part of the stream. Of the coniferous trees the spruce and balsam-fir are the most abundant, but these are usually small rarely attaining a diameter of a foot and usually much less. A few varieties of pine are occasionally seen. The whole region has been fire swept, virgin forests being very rare, and offers most favorable conditions for the study of the problems of reforestation. The aspen and white birch are the deciduous trees which usually follow the fires, sometimes the one predominating and sometimes the other, but appearing never to mix, a fact which is difficult to account for as there is apparently no differences in soil conditions.

Of the smaller woody shrubs, the mountain-maple, alder, bear-berry were common and the ground hemlock occurred in abundance often covering considerable areas. While the number of varieties was small the number of individuals was very great. Among herbaceous plants, the willow-herb, bellflower, ragweed, dock, smartweed, gentian, golden rod, and asters were some of the most common. Sedges were very abundant but grasses were comparatively few.

Among the lower plants, a few ferns were seen, an abundance

of mosses and their allies especially marchantia which often formed dense mats several yards in diameter. Fleshy fungi were found to be most abundant, but as the season was characterized by an abundance of rain, it became impossible to preserve these forms by drying in the usual way.

Dr. P. A. Rydberg spoke at some length on "Application of the Vienna Code of Nomenclature" to American botany, giving illustrations of some of the intricate problems which are encountered by the student of systematic botany. Owing to the technical nature of this discussion, it becomes impossible to present a full synopsis at this time.

FRED. J. SEAVER.

THE PRESERVATION OF NATIVE PLANTS.

STOKES FUND PRIZES.

The New York Botanical Garden offers the following prizes for essays not exceeding 5,000 words, from the income of the Caroline and Olivia E. Stokes Fund for the Preservation of Native Plants: (1) $40.00, (2) $25.00, (3) $15.00.

Essays must be typewritten in duplicate and must reach the Garden not later than June 20, 1909.

NEW YORK BOTANICAL GARDEN,
BRONX PARK,
NEW YORK CITY.

NOTES, NEWS AND COMMENT.

Mr. Lowell M. Palmer has recently given to the Garden about one hundred plants, mostly ferns, from his conservatories at Stamford, Connecticut.

The Garden has recently secured through exchange with the Zoölogical Park about five hundred excellent nursery trees, which are especially valuable at this time for planting along the new roads and in the vicinity of the new conservatories.

Dr. J. A. Shafer, Museum Custodian, has made several shipments of plants from the eastern provinces of Cuba, where he has been engaged for several months in botanical exploration.

Dr. N. L. Britton and Dr. Marshall A. Howe returned to the New York Botanical Garden on April 14 after a successful expedition to eastern Jamaica, eastern Cuba, and the Florida Keys. Mrs. Britton, who was a member of the party, returned a few days earlier. A more detailed account of the expedition and its results will be published in a later number of the JOURNAL.

We learn from *Science* that "The University of Michigan has acquired by gift of an alumnus, and from the City of Ann Arbor, a tract of land of about ninety acres to serve as a botanical garden and arboretum. This land has an exceptional variety of soil, elevation and exposure, including a border of over one half mile on the Huron River."

Dr. Ezra Brainerd, of Middlebury College, Vermont, spent a day at the Garden early in March studying certain species of violets. He was on his way to Florida to study the violets of the peninsula as part of his investigations preparatory to the completion of a monograph of the violets of North America. On his return in April he spent another day and reported interesting observations.

Number 18, completing Vol. V, of the *Bulletin of the New York Botanical Garden* was issued February 8, 1909. It contains the following papers: "Contributions to the Flora of the Bahamas — IV," by N. L. Britton; "The Elgin Botanical Garden, its Later History, and Relation to Columbia College and the Vermont Land Controversy," by Addison Brown; "The Genera of North American Gill Fungi," by F. S. Earle. These papers were published in advance at considerable intervals, the first being distributed in pamphlet form as long ago as October 26, 1907.

Number 20, Vol. VI, of the *Bulletin of the New York Botanical Garden*, containing the annual reports of the Director-in-Chief and other official documents was issued March 23, 1909.

Meteorology for March. — The total precipitation recorded for the month was 3.53 inches, including a snow-fall of 3 inches on the 4th and a light snow on the 30th. Maximum temperatures were recorded of 49.5° on the 2d, 68.5° on the 10th, 51° on the 21st, and 56° on the 24th; also minimum temperatures of

18° on the 6th, 27° on the 12th, 21.5° on the 18th and 26° on the 27th. The mean temperature for the month was 43.25°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

210 specimens of flowering plants from Connecticut. (By exchange with Dr. E. H. Eames.)

1 specimen of *Hypnum bergenense* from Vermont. (Given by Dr. A. J. Grout.)

2 specimens of woody fungi from Georgia. (Given by Dr. R, M. Harper.)

20 specimens of fleshy fungi from New Jersey. (Given by Mr. W. H. Ballou.)

1 museum specimen of *Peridermium* from South Carolina. (Given by Dr. H. H. Rusby.)

200 specimens, "Fungi Columbiani," Cent. 28 and 29. (Distributed by Mr. E. Bartholomew.)

2 specimens of *Triglochin concinna*. (By exchange with the University of California.)

1 museum specimen of cat-tail leaves from Italy. (Given by Mr. Charles Civita.)

1,500 specimens of flowering and flowerless plants from South Florida. (Collected by Dr. J. K. Small and Mr. J. J. Carter.)

3 specimens of *Scleroderma vulgare* from Pennsylvania. (Given by Dr. J. K. Small.)

1 specimen of *Fomes ungulatus* from Colorado. (Given by Prof. E. Bethel.)

1 specimen of *Inonotus perplexus* from Connecticut. (Given by Prof. A. H. Graves.)

1 specimen of *Coriolus versicolor*. (Given by Mr. P. I. Bryce.)

LIBRARY ACCESSIONS FROM FEBRUARY 1 TO MARCH 31, 1909.

ARTHUR, JOSEPH CHARLES, BARNES, CHARLES REID, & COULTER, JOHN MERLE. *Handbook of plant dissection*. New York, 1893. (Given by Dr. W. A. Murrill.)

BOYER, EMANUEL R. *Laboratory manual in elementary biology*. Boston, 1898. (Given by Dr. W. A. Murrill.)

CLARK, CHARLES H. *Laboratory manual in practical botany*. New York, 1898. (Given by Dr. W. A. Murrill.)

DARWIN, FRANCIS. *Life and letters of Charles Darwin*. New York, 1904. 2 vols.

DETMER, WILHELM. *Das kleine pflanzenphysiologische Praktikum*. Ed. 3. Jena, 1909.

DIELS, LUDWIG. *Pflanzengeographie*. Leipzig, 1908. (Deposited by the Trustees of Columbia University.)

DÖRFLER, IGNAZ. *Botaniker-Adressbuch*. Ed. 3. Wien, 1909.

ERRERA, LÉO. *Recueil d'oeuvres*. Bruxelles, 1908–09. 3 vols. (Given by Madame Léo Errera.)

FREDERICQ, LÉON, & MASSART, JEAN. *Notice sur Léo Errera*. Bruxelles, 1908. (Given by Madame Léo Errera.)

GANONG, WILLIAM FRANCIS. *A laboratory course in plant physiology*. Ed. 2. New York, 1908. (Deposited by the Trustees of Columbia University.)

HOEFER, FERDINAND. *Histoire de la botanique*. Paris, 1882. (Given by Dr. W. A. Murrill.)

HUNTER, GEORGE WILLIAM. *Elements of biology*. New York, 1907. (Given by Dr. W. A. Murrill.)

KANNGIESSER, FRIEDERICH. *Die Etymologie der Phanerogamennomenclatur*. Gera, 1908.

LINNAEUS, CARL. *Species plantarum*. Holmiae, 1753. Facsimile-Edition, published in 1907. 2 vols.

NACCARI, FORTUNATO LUIGI. *Algologia adriatica*. Bologna, 1828.

PEPOON, HERMAN S., MITCHELL, WALTER REYNOLDS, & MAXWELL, FRED BALDWIN. *Studies of plant life*. Boston, 1900. (Given by Dr. W. A. Murrill.)

PILGER, ROBERT. *Das System der Blütenpflanzen mit Ausschluss der Gymnospermen*. Leipzig, 1908. (Deposited by the Trustees of Columbia University.)

POLOWZOW, WARWARA. *Untersuchungen über Reizerscheinungen bei den Pflanzen*. Jena, 1909.

SCHRÖTER, CARL. *Eine Exkursion nach den Canarischen Inseln*. Zürich, 1909.

STAHL, ERNST. *Zur Biologie des Chlorophylls*. Jena, 1909.

VÖCHTING, HERMANN. *Untersuchungen zur experimentellen Anatomie una Pathologie des Pflanzenkörpers*. Tübingen, 1908.

WETTSTEIN, RICHARD VON. *Handbuch der systematischen Botanik*. Vol. 2. Leipzig, 1903–08.

WOOD, ALPHONSO. *Flora atlantica:* descriptive botany; being a succinct analytical flora. New York [1870]. (Given by Dr. W. A. Murrill.)

PLANTS AND SEEDS.

6 plants for the conservatories. (By exchange with Mr. Frank Weinberg.)

1 plant of *Dendrobium Phalaenopsis* for the conservatories. (By exchange with Mr. A. J. Manda.)

1 plant of *Trichopilia* for the conservatories. (Collected in Jamaica, W. I., by Dr. N. L. Britton.)

2 plants of *Alcicornium grande* for the conservatories. (Given by Messrs. Pankok and Schumacher.)

2 plants of *Clematis* for the nursery. (By exchange with Bureau of Plant Industry.)

3 plants of *Crataegus Canbyi* for the nursery. (Given by Mr. W. W. Eggleston.)

1 plant of *Smilax lanceolata* for the conservatories. (Collected in Summerville, S. C., by Dr. H. H. Rusby.)

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Journal of the New York Botanical Garden, monthly, illustrated, containing notes, and non-technical articles of general interest. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Vol. I, 1900, viii + 213 pp. Vol. II, 1901, viii + 204 pp. Vol. III, 1902, viii + 244 pp. Vol. IV, 1903, viii + 238 pp. Vol. V, 1904, viii+242 pp. Vol. VI, 1905, viii+224 pp. Vol. VII, 1906, viii + 300 pp. Vol. VIII, 1907, viii + 290 pp. Vol. IX, 1908, viii+242 pp.

Bulletin of the New York Botanical Garden, containing the annual reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations carried out in the Garden. Free to all members of the Garden; to others, $3.00 per volume. Vol. I, Nos. 1–5, 449 pp., 3 maps, and 12 plates, 1896–1900. Vol. II, Nos. 6–8, 518 pp., 30 plates, 1901–1903. Vol. III, Nos. 9–11, 463 pp., 37 plates, 1903–1905. Vol. IV, Nos. 12–14, 479 pp., 14 plates, 1905–1907. Vol. V, Nos. 15–18, 463 pp., 17 plates, 1906–1907; Vol. VI, No. 19, 114 pp., 1908.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies and Central America. Planned to be completed in thirty volumes. Roy. 8vo. Each volume to consist of four or more parts. Subscription price $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Vol. 22, part 1, issued May 22, 1905. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae.

Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

Vol. 25, part 1, issued August 24, 1907. Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908, contains descriptions of the family Grossulariaceae by F. V. Coville and N. L. Britton, the Platanaceae by H. A. Gleason, the Crossosomataceae by J. K. Small, the Connaraceae by N. L. Britton, the Calycanthaceae by C. L. Pollard, and the Rosaceae (pars) by P. A. Rydberg.

Vol. 22, part 4, issued Nov. 20, 1908. Rosaceae (pars) by P. A. Rydberg.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Dr. Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by Dr. D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. In press.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. Four volumes.

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114. The Boleti of the Frost Herbarium, by William A. Murrill.
115. Some North Dakota Hypocreales, by Fred J. Seaver.
116. Notes on Rosaceae, by Per Axel Rydberg.
117. Studies in North American Peronosporales—IV. Host Index, by Guy West Wilson.
118. Studies of West Indian Plants—II, by N. L. Britton.
119. North Dakota Slime-Moulds, by Fred J. Seaver.

NEW YORK BOTANICAL GARDEN
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The New York Botanical Garden

EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

OF

The New York Botanical Garden

VOL. X. May, 1909. No. 113.

BOTANICAL EXPLORATION IN THE WEST INDIES AND FLORIDA.

TO THE SCIENTIFIC DIRECTORS.

Gentlemen: In continuation of botanical exploration and collecting in the West Indies and tropical continental America, as previously authorized, I was absent from the Garden from February 20 to April 14, 1909; I was accompanied by Dr. Marshall A. Howe, a curator of the museums, and by Mrs. Britton. Dr. Howe's special errand was the increase of our collections of algae and the study of habitats and distribution of these plants; he also aided me in the collecting and preservation of land plants and took many photographs of plants and of landscapes which will furnish valuable additions to our collection of lantern slides for public lectures and supply important illustrations for our publications; his account of work accomplished is appended to this report.

The first part of this expedition was the continuation of work in Jamaica, commenced several years ago, in coöperation with the Department of Public Gardens and Plantations, now the Department of Agriculture, of that island,* looking toward the completion and publication of the annotated catalogue of Jamaica flowering plants which I have been preparing with Mr. William Harris, Superintendent of Public Gardens and Plantations.

We reached Kingston on February 25 and devoted two days to studies at the Hope Botanical Gardens, where we were cor-

* See Journal N. Y. Botanical Garden, 7: 245; 8: 51, 229; 9: 81, 163; 10: 21.

dially received by Hon. H. H. Cousins, Director of Agriculture, who facilitated our work in many ways; we had a pleasant interview with his Excellency, Sir Sydney Olivier, and are grateful to him for his interest in our investigations.

Our principal object in visiting Jamaica at this time was the exploration of the difficult John Crow Mountain Range, near the eastern end of the island, which we had failed to accomplish last autumn, owing to heavy rains. We proceeded by carriage from Kingston on February 28, accompanied by Mr. Harris, driving forty miles east along the south coast to Bowden, on the beautiful harbor of Port Morant, where the Peak View Hotel of the United Fruit Company was made the collecting base for two weeks. A number of interesting plants were found in thickets and woodlands along the road, among them a fine climbing vine of the genus *Paullinia*, of the Soapberry Family, covered with showy fruit, museum specimens of which were obtained.

The next day was taken up with making arrangements for guides and bearers and in visiting Stokes Hall, the residence of A. C. Bancroft, Esq., where we were hospitably received by Mrs. Bancroft, and were shown the interesting stone mansion, which was built in the time of Cromwell, and the pond in which the Asiatic lotus (*Nelumbo*) has been established for many years.

Our first penetration of the John Crow Mountains was accomplished on March 2, 3, and 4, leaving Mrs. Britton at Bowden to care for the collections. Mr. Harris and I drove to Bachelor's Hall, the scene of our failure last autumn, and with five men climbed into the southeastern foothills of the range, traversing cleared and cultivated slopes up to about 900 feet altitude, succeeded by the wonderfully attractive virgin forest, composed of many kinds of tall trees, among them magnificent specimens of the mammee apple (*Mammea americana*), widely distributed in the West Indies, but here reaching splendid development, and the local and little-known *Lunania polydactyla*, of the Flacourtia Family, of which excellent specimens were collected; the undergrowth of the forest is composed of many kinds of small trees and shrubs, several of them seen here by us for the first time, together with many ferns, and a fine growth of the long-thatch

palm (*Geonoma*), among which we camped at 1,200 feet elevation, using the leaves for bed mattresses and for the roof. The night was wonderfully clear and cool, the moon shining brightly down through the splendid palms, and the chorus of tree-toads, or other batrachians, evidently of several kinds, supplying quite novel music which rose and fell.

Starting soon after sunrise the next morning, we climbed steep slopes up to a plateau known as the "Big Level" at about 2,200 feet elevation; the collections made up to noon were sent out to Bachelor's Hall by one of the bearers and thence to Bowden for preservation. We were disappointed in finding that the forest on the "Big Level" had been practically destroyed by the hurricane which devastated much of Jamaica a few years ago, but succeeded in crossing it by hunters' trails, and by slow climbing through fallen logs reached 2,620 feet altitude, by aneroid barometer reading, the crest of the range being apparently at least 400 feet higher. Camp "*Geonoma*" was occupied again, and on March 4 we explored the forest in the vicinity, which proved to be the best collecting ground, yielding specimens of many interesting species, the most elegant being a vine of the Meadow Beauty Family with great masses of rose-pink flowers. We walked down to Bachelor's Hall in the afternoon and reached Bowden in the evening, well satisfied with the results of the trip.

Mr. Harris having to return to Hope Gardens for a few days for official duties, a second trip to the John Crow Range was deferred until the following week. On March 5 a study was made of the coastal hillsides near Bowden; on March 6 a horseback trip was made to the Cuna Cuna Gap, and the following day was given to collecting in the coastal woodlands and thickets at Holland Bay and Morant Point; many interesting species of trees and shrubs were found on these trips and large collections were made. We were hospitably received at the Morant Point Lighthouse by Capt. W. H. Boorman and Mrs. Boorman.

Our second penetration of the mountain range was made on March 9, 10, and 11, with the kind coöperation of the Hon. Commander Edward Codrington Hall, R. N., Custos of the Parish of Portland, who placed his mountain camp at our dis-

posal and permitted us to use some of his men as guides and bearers; this excellent base is located on the eastern slope of the southern end of the John Crow Mountains at an altitude shown by the aneroid barometer to be about 1,600 feet, at a clearing in the primeval forest; although not more than five miles distant from our camp of the previous week, the forest trees and other plants were quite different, well illustrating the peculiarly local distribution of many elements of the West Indian flora, associated with different exposures, annual rainfall, and altitude; the most noteworthy tree is a magnificent fan-leaved palm of the genus *Thrinax*, with leaves of young plants over 10 feet in diameter, the old trees with trunks up to 60 feet high or perhaps even higher and nearly a foot in diameter, truly the monarch of the genus, and a splendid addition to our knowledge of it; a fine spider-lily (*Hymenocallis*) with large white flowers was abundant, and the tree *Lunania racemosa*, with long drooping clusters of small flowers, was of special interest, because it had not been seen by botanists for many years. We had rain at Commander Hall's camp, but not enough to interfere seriously with collecting, and by sending bearers out with the specimens to Mrs. Britton at Bowden, everything obtained was safely preserved.

The upper slopes and crest of the John Crow Range may be reached from this camp by cutting a trail through the forest; Commander Hall cordially assented to a suggestion that such a path be made through his extensive forest lands at some future time, to enable botanists to go still further into this fascinating wilderness; the large number of new and rare species found by us within a few miles of his camp is evidence that many more await the botanical explorer in the more distant parts of this forest. Camp "*Thrinax Rex*" thus becomes of much botanical importance, and we are grateful to Commander Hall for facilitating our work.

March 12 was taken up in packing the collections and in writing up the note-books. While at Bowden our operations were facilitated by Mr. and Mrs. J. B. Kilburn, of the Peak View Hotel, and by Mr. C. C. Langlois, manager of the United Fruit Company; they have our gratitude for their kind coöperation.

On March 13, Dr. Howe, Mrs. Britton, and I drove from Bowden to Port Antonio, and took the steamer "Aviles" for Santiago, Cuba, thus closing this episode in the botanical exploration of Jamaica. The scientific results were noteworthy and the collections of the Garden were materially increased. I now plan to complete the manuscript of the Jamaica flora.

Our purposes in visiting eastern Cuba were the increase of the Garden's collections of Cuban species; to further determine the

FIG. 17. *Acrocomia*, near San Juan Hill, Cuba.

relations between the Cuban flora and that of the Bahamas, Florida, and Jamaica; to obtain additional plants and specimens for study in connection with the preparation of the annotated list of Cuban plants by Mr. Percy Wilson, my administrative assistant; and to obtain more information about the cactuses of Cuba for use in the studies of Cactaceae which I am prosecuting in coöperation with Dr. J. N. Rose, of the United States National Museum.

Arriving at Santiago on the morning of March 14, we visited the historic military points in the afternoon and took photographs of some typical trees, including the beautiful *Sterculia* on San Juan Hill and fine specimens of the Corozo Palm (*Acrocomia*). March 15 was spent in studying the flora of the coastal hills along the harbor of Santiago. The most striking plant found was a maguey (*Agave*) in full bloom and abundant; its large panicles of yellow flowers were very showy and we secured plenty of living plants and herbarium specimens for division with Professor William Trelease, Director of the Missouri Botanical Garden, who has long been prosecuting studies of the "century plants."

The privilege of stopping at the United States Naval Station at Guantanamo Bay, east of Santiago, had been kindly granted by the Hon. Truman J. Newberry, Secretary of the Navy, upon the request of Hon. Addison Brown, Chairman of the Executive Committee of the Board of Managers of the Garden, and we proceeded there on March 16; we were most cordially received by Capt. C. H. Harlow, Commandant of the Station, who hospitably entertained us on the station ship "Newark," gave us the use of a large bungalow on shore, and provided us with bearers, carts, row-boats, and steam-launches, and evidenced much interest in our work. We kept house in the bungalow for two weeks, and it was a most satisfactory collecting base; supplies were obtained from the station store and from the canteen of the "Newark," while Capt. Harlow's kind permission to botanize his garden for fresh vegetables contributed greatly to our comfort and happiness.

The Naval Reservation includes about fifty square miles, partly hilly, partly mangrove swamp, and partly plains of very slight elevation called savannas or salinas, which are flooded after heavy rains, and a bench of coral limestone about forty feet high extends around the bay, much broken by erosion, forming picturesque headlands and islands; the corals composing this interesting bench are remarkably well preserved, masses three or four feet in diameter being exposed in cuttings for roads and wharfs. Numerous roads, trails, and survey lines intersect the thickets and woodlands, permitting studies of the vegetation with-

out much clearing of the way and we were thus enabled to examine the vegetation of a large part of the area, the launches of the "Newark" obligingly landing us wherever desirable.

The coral limestone bench is characterized by a beautiful silver-thatch palm (*Coccothrinax*) and with it is associated a flora of low trees, shrubs, and herbaceous plants of great variety, some of them of much botanical interest. Along the borders of the low plains grow plants of saline soil, mostly of wide distribution

FIG. 18. *Coccothrinax*, Guantanamo Bay, Cuba.

in the West Indies. In the thickets at low elevations, another group of species occurs and here we were delighted to find two of the cactuses which we were especially desirous of seeing. One of these is a diminutive species of *Mamillaria*, not over two inches in diameter, which grows among fallen leaves under trees and shrubs, difficult to detect, but fortunately found by Mrs. Britton while searching for mosses, and after its habitat had been thus determined, it was found in considerable quantities, growing in

colonies up to two feet across; its small yellowish flowers are inconspicuous. Inasmuch as we had searched the Jamaican thickets in vain for this interesting little plant, we were especially pleased to find it here, and a basketful of it was gleefully taken. The other cactus of particular interest is the gigantic *Cereus nudiflorus* known only from Cuba, a most extraordinary plant attaining tree-like dimensions and outline. A magnificent specimen was found within a hundred feet of the first Mamillarias,

FIG. 19. *Cereus nudiflorus*, Guantanamo Bay, Cuba.

with a trunk two feet in diameter branching at four or five feet above the base into several stout limbs, and these repeatedly branching into a round-topped plant about 35 feet high with a spread as great as its height, the ultimate 3-angled to 5-angled branches characteristically drooping. I was told that the plant attains even greater dimensions, its height sometimes being 50 feet or more. It was just coming into bloom at the time of our visit, its

ultimate branches covered with buds, but none expanded before we came away; I carried a branch along hoping to see a flower expand, but the buds wilted. I hope to secure flowers and fruit later, however, our guide being instructed to pick them and preserve them in a jar of formalin solution left with him for that purpose.

In all, thirteen species of cactuses were seen in the Guantanamo Valley and on the hills, and cuttings or plants of all of them were collected and shipped to the Garden; the coastal hillsides

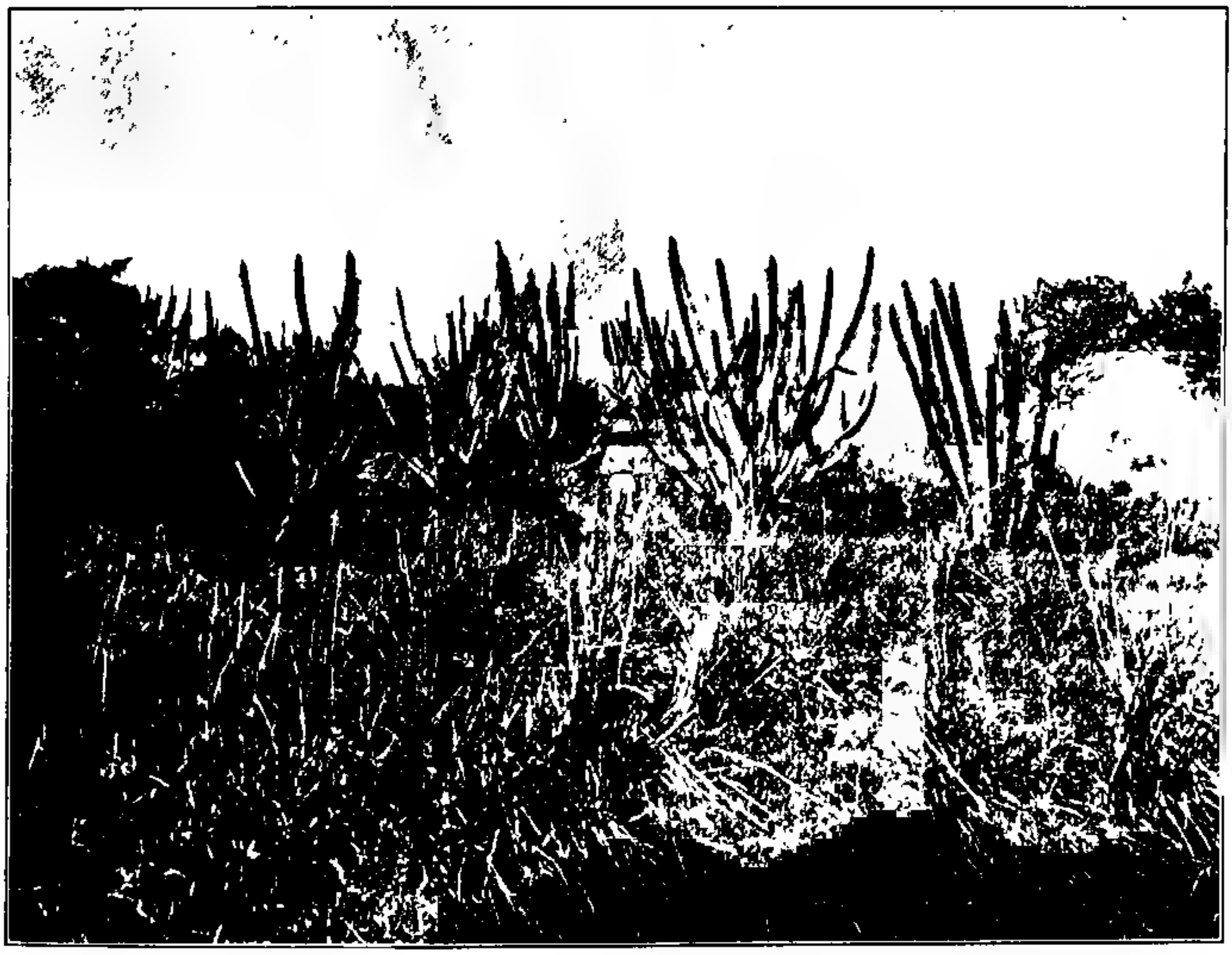

FIG. 20. *Cereus Hystrix*, Guantanamo Bay, Cuba.

are veritable cactus deserts in places, and the rainfall is evidently very little. *Cereus Hystrix*, a columnar species with upright branches, reaches 35 feet in height, and is sometimes so scattered in the landscape as to form natural cactus parks. These coastal hillsides also harbor quantities of the Cuban melon cactus, and a large number of small trees and shrubs not found farther inland.

The maguey or century plant found on the hillsides of Santiago harbor grows here also abundantly, as well as another

species of agave having whitish leaves, not in bloom in March, and the Cuban *Furcraea*, a related genus, also occurs in the thickets, flowering later in the year. Living plants of all were collected. Altogether, within the naval reservation we found between 350 and 400 species of land plants, and brought away specimens of most of them; the total land flora of the area probably includes at least 500 species. We are indebted to Mr. G. W. Miller, manager of the station of the Central and South

FIG. 21. Agaves and *Furcraea*, Guantanamo Bay, Cuba.

American Telegraph Company at Fisherman's Point, Guantanamo Bay, and to Mrs. Miller, for their delightful hospitality and for aid in collecting plants, a letter of introduction to Mr. Miller having been given me by Mr. James A. Scrymser, president of the Telegraph Company and chairman of the Board of Managers of the Garden.

Mr. Theodore Brooks, manager of the Guantanamo Sugar Company, has been of great service to naturalists visiting eastern

Cuba, and his interest in natural objects was well known to me, so it was with keen pleasure that we made his acquaintance at a dinner thoughtfully arranged by Capt. Harlow on the " Newark," the evening after our arrival, and I gladly accepted an invitation to study certain of the woodlands and thickets on the vast estates under his management, which are intersected by railroads in all directions through the valley north of the naval reservation ; I spent March 19 with him, his private locomotive-car furnishing

FIG. 22. *Pereskia*, Nuevaliches, near Guantanamo, Cuba.

a convenient means of moving from point to point between Caimanera and Guantanamo, mainly on the Los Caños Estate, where we were hospitably received by Mr. Daniel Batiste, manager, and on further invitation we proceeded to Guantanamo on leaving the naval station on March 31 and devoted two days to additional work in this field. Near Nuevaliches, we found and studied an interesting cactus of the genius *Pereskia ;* this genus differs from most cacti in having well-developed leaves. We are

grateful to Señor Don Manuel Leon Valdes, Chief of Customs at Caimanera, for his aid in shipping our collections to New York.

On the San Carlos Estate we were enabled, under the guidance of Mr. Chas. F. Ramsden, manager, to examine the fine forest, which yielded us specimens of many plants not seen nearer the coast, many of the trees up to 90 feet high, and the undergrowth very dense. A very small and delicate filmy-fern, growing on tree-trunks, was one of the more interesting species de-

FIG. 23. The Cuban "cherry," *Cardia calococca*, near Guantanamo.

tected. Here, on the San Carlos estate, we saw and photographed a curious palm, one of the endemic Cuban species of *Copernicia*, its young growth covering large areas and almost impossible to eradicate. The hospitality of Mr. and Mrs. Brooks was unbounded and we left Guantanamo with delightful recollections of our visit and with an invitation to return and occupy any of the five great estates as collecting bases in the future.

Proceeding by rail to San Luis, north of Santiago, on the morning of April 2, the afternoon was given to collecting in the hills a few miles to the south, and a valley in natural woodlands yielded us specimens of many species, including several kinds of maiden-hair ferns (*Adiantum*), mosses, and fungi. Traveling east by rail we stopped over a day at the picturesque old city of Camaguey, and devoted it to collecting and photographing in the interesting palm barren at Santayana, a few miles east, where

FIG. 24. *Copernicia* in palm barren, Santayana, Cuba.

specimens of seventy-five species not seen elsewhere were obtained. The Hotel Camaguey, located in old Spanish cavalry barracks, is a delightful and unique hostelry operated by the Cuba Railroad Company.

In order to obtain plants and specimens illustrating the flora of northern Cuba, I had detailed Dr. J. A. Shafer, Museum Custodian, in January, to work in the vicinity of Nuevitas and other parts on the north coast and, in response to a telegram, he met

us at Camaguey, and rendered a preliminary report showing that his errand had been satisfactorily accomplished, very large collections having been secured and shipped; his complete report will be separately submitted. Camaguey was our last Cuban collecting point; the results of our work will add much to the knowledge of the flora, but a great amount of exploration in Cuba will be necessary before its plants can be fully known.

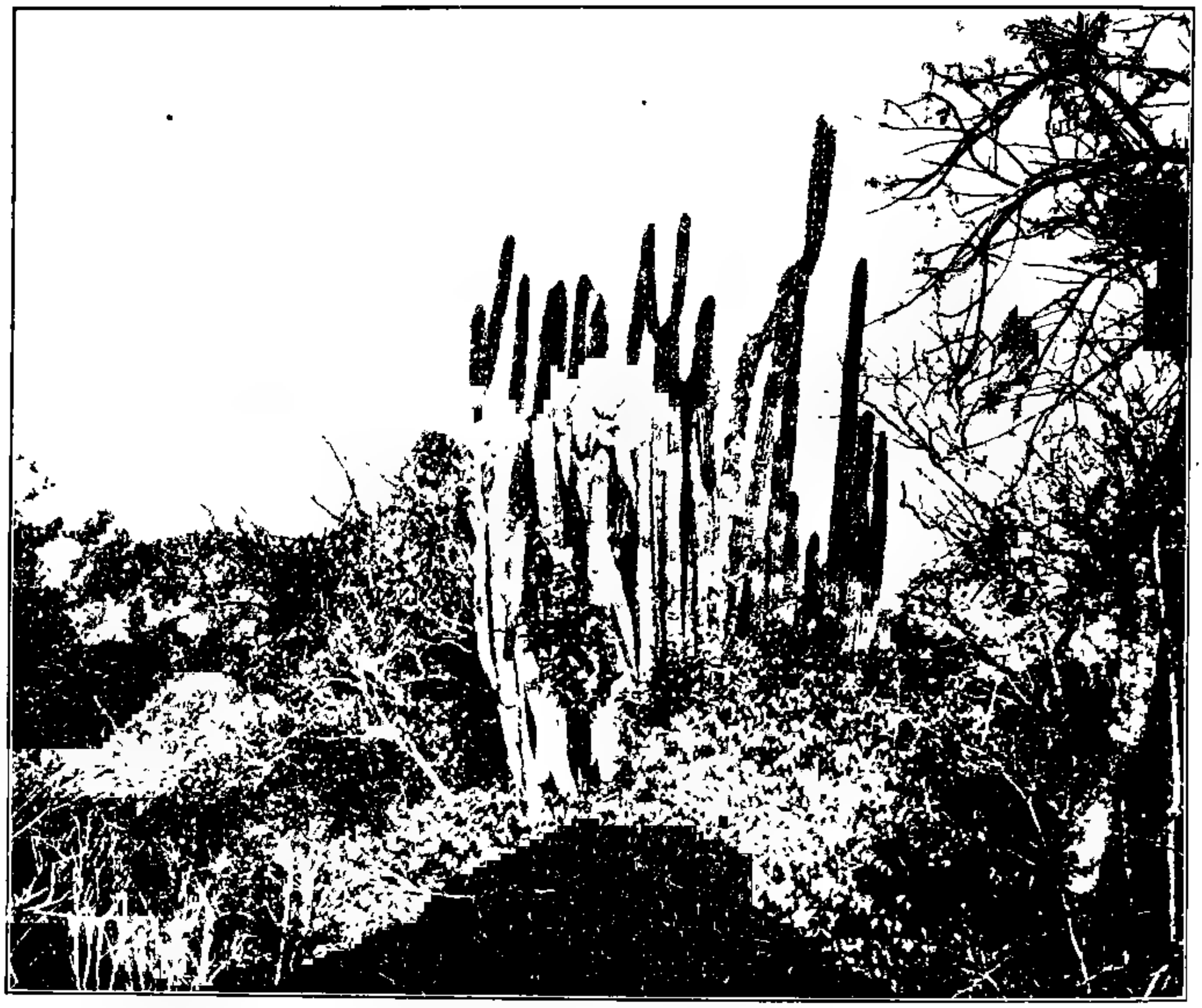

FIG. 25. *Cephalocereus*, Key West, Florida.

We reached Key West from Havana on the morning of April 7. I was much pleased to find in thickets on this island the tall branched columnar cactus found there many years ago by Dr. Blodgett, and imperfectly described in Dr. Chapman's "Southern Flora" under the name *Cereus monoclonos*, which is really a Haitian species and probably different; in Dr. Small's "Flora of the Southeastern United States," Dr. Chapman's incomplete understanding of the plant is repeated;

in both descriptions the plant was confused with the Florida *Harrisia*. This cactus attains a height of 18 feet, and is abundant in hammock-lands back of the fort known as the first tower; as these are government lands it is hoped that the plant may be preserved, and as Key West is the only place in the United States where it is known to grow this is very desirable. Isolated specimens were seen at other points on the key, indicating that it was formerly more abundant than now. It is the same as a species

FIG. 26. *Opuntia inermis*, Boot Key, Florida.

of the Bahama Islands, or closely related; photographs, living plants, flowers, and fruit were secured. The half-climbing and arching long-spined cactus known as *Cereus baxaniensis* is also in these thickets, but this is widely distributed through the Florida Keys. Specimens of several interesting trees and shrubs were also collected here.

I had hoped, in order to complete the manuscript of the "Ba-

hama Flora," in coöperation with Dr. C. F. Millspaugh, of the Field Museum of Natural History, to visit Cay Sal, situated across the Gulf Stream about east-southeast from Key West, and the nearest Bahamian island to Cuba. With this in view I had arranged with Mr. Norberg Thompson, of Key West, for the use of a schooner, and he had obligingly prepared the "Etta L. Thompson" for our use. We sailed from Key West on April 12 and proceeded up the Florida Keys under light southeast winds, unfavorable for our purpose, to Boot Key near Knight's Key, the nearest Florida point to Cay Sal, where the wind failed altogether; this gave us a capital opportunity, however, to examine the land and water vegetation on and around Boot Key, and quite large collections were made; I am not aware that this key had been previously visited by botanists; the prickly-pear cactus *Opuntia inermis* is abundant, and fine living specimens were secured; living plants of an interesting narrow-leaved *Agave* were also shipped to the Garden. When the wind blew the next time its direction was right for crossing the Gulf Stream, but there was too much of it and a northerly gale swept the coast for two days, changing to all points of the compass, and having given five days to the weather, we reluctantly concluded that our available time would not permit us to attempt the trip to Cay Sal. Dr. Howe and I returned to New York from Knight's Key by rail, Mrs. Britton having preceded us by four days.

The collections, including living plants, museum and herbarium specimens made by us and by Dr. Shafer are represented by over 3,000 field numbers, aggregating at least 10,500 individual specimens, and their study will throw much light on the character and distribution of the West Indian flora. The expenses of the work were defrayed by liberal contributions to the Exploration Fund by Mr. J. Pierpont Morgan and by Mr. D. O. Mills, president of the Board of Managers.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

Report on an Expedition to Jamaica, Cuba, and the Florida Keys.

Dr. N. L. Britton, Director-in-Chief.

Dear Sir: By way of supplement to your report on our recent expedition to Jamaica, Cuba, and the Florida Keys, I beg to submit the following brief outline of the work accomplished during that period in connection with the collection and study of the marine algae.

On the morning of February 25, I was landed at Port Antonio, Jamaica, from the steamer "Clyde" of the Royal Mail Steam Packet Company, while you and Mrs. Britton proceeded to Kingston. During a visit to Jamaica in December, 1906, and January, 1907, I had enjoyed the privilege of collecting the algae of the vicinity of Kingston, on the southern coast of the island, and about Montego Bay on the northwestern coast. A plan to visit Port Antonio at that time was frustrated by the disastrous earthquake of January 14, 1907. The algae of Jamaica and of Port Antonio in particular have become fairly well known through the collections made by the lamented Dr. James Ellis Humphrey, associate professor of botany in Johns Hopkins University, who lies buried in the Port Antonio cemetery, and through the collections of Mrs. Cora E. Pease and Miss Eloise Butler. The specimens obtained by these collectors formed the chief basis of the list of Jamaican marine algae published by Mr. F. S. Collins in 1901. With the hope of adding to the Garden's herbarium most of the species found here by the collectors named, as well, possibly, as others that escaped their attention, I found the opportunity of spending a few days at Port Antonio most welcome. I remained there about six days, during which time I was enabled to examine the marine flora of the harbor and of points on the adjacent coast as far east as the "Blue Hole" and as far west as St. Margaret's Bay. The reefs to the north of Navy Island, which forms the main barrier of the inner harbor of Port Antonio, were perhaps of the greatest interest. In some of the more protected places on the landward side of these reefs were growing three species of *Avrainvillea* and five of *Halimeda* (*Tuna, tridens,*

Monile, *simulans*, and *Opuntia*), while on the seaward exposures were the more surge-loving Liagoras, Galaxauras, and corallines. On a pebble, intermingled with *Neomeris annulata*, was the minute and dainty *Acetabulum polyphysoides*, which is probably common throughout the West Indian region, even though it ordinarily remains undetected owing to its small dimensions. One of the most interesting finds at Port Antonio was what appears to be a plant of the species originally described from Guadeloupe in 1854 by J. Agardh as *Bryopsis Duchassaingii* and redescribed in 1860 by Montagne as representing a new genus, *Trichosolen*, with *Antillarum* as its specific name. So far as the writer is aware, this plant has hitherto been known only from the Guadeloupe collections of fifty or more years ago. It was found growing attached to a stone at about the low-water line. The same thing was found in greater abundance a few days later at Port Morant on the eastern coast of the island, where I arrived on March 3, stopping at the Peak View Hotel at Bowden, where you and Mrs. Britton and Mr. Harris had already established headquarters. In and about Port Morant one finds a great variety of conditions as regards the nature and degree of exposure of the shore-line, from the protected waters of the harbor to the outside rocks and beaches, where the easterly trade-winds keep the waters in almost constant agitation. Accordingly, the marine plants of the Port Morant region are varied and abundant. On the wooden piers of the wharves of the eastern side of the harbor, six species of *Caulerpa* thrive luxuriantly. On the stones and pebbles near by grow the interesting "*Trichosolen*" mentioned above and the almost equally rare *Siphonocladus tropicus*. In shallow water on rocks nearer the mouth of the harbor grows the exquisitely formed *Dictyurus occidentalis*, a species which I had previously found only in the form of fragments washed on the shore. Creeping on exposed surge-swept rocks outside the harbor, a handsome *Asparagopsis* was found. An interesting day was spent at Holland Bay and Morant Point, the extreme eastern end of the island of Jamaica. Here good specimens of *Gracilaria cervicornis* were being washed ashore, and *Petrosiphon*, an encrusting Valoniaceous plant which I ven-

tured a few years ago to describe as a new genus from the Bahamas, was growing on the rocks.

The next of our stations at which I was able to make any considerable collections of algae was at Guantanamo Bay, Cuba, on the U. S. Naval Station's reservation, where I began work on March 17. The inner portions of this large bay are or have been fringed with red mangroves (*Rhizophora Mangle*) and the adjacent bottom consists mostly of "mangrove mud," on which the marine plants are not especially diversified or abundant, but toward the mouth of the harbor and on the outer coast, which is chiefly rock-bound, there is much of interest. Several of the plants collected here were entirely new to me and I would not venture an opinion as to their affinities until there has been an opportunity for a more critical study of their structure. Among the more readily recognizable plants of peculiar interest were that which I described in 1905 from Cape Florida as *Sarcomenia filamentosa* and which, so far as I know, had not been collected elsewhere, and also *Neomeris mucosa*, a well-marked species which I had recently proposed as new on the basis of material collected last year in the Caicos Islands and the southern Bahamas.

In Key West, Florida, on April 7, I enjoyed an opportunity of making a brief comparison of the spring marine flora, as exhibited by the seaweeds washed ashore, with the autumn flora of the same places, as recalled from previous experiences in Key West in October and November, 1902. Most of the species observed were common to these two periods, but my general impression is that the marine flora of the autumn months is considerably more varied and abundant. In the two days that we spent on and about Boot Key I was able to secure several plants of interest, including good specimens of the large and handsome *Caulerpa Ashmeadii*, which previously I had found only in the form of fragments washed ashore at Key West. *Caulerpa lanuginosa* was in greater abundance and better development here than I had ever seen it elsewhere and *Caulerpa prolifera* was not uncommon. I was able also to obtain a good series of luxuriant specimens of the recently published *Halimeda simulans*, here, as

usual, growing associated with *Halimeda Monile* and *H. tridens* but without a trace of intergrading. *Halimeda discoidea* and *H. scabra* were well represented, but in a different exposure from the three species just mentioned.

A portion of my time in Jamaica, Cuba, and the Florida Keys was devoted to photographing cacti, agaves, palms, and other characteristic plants of the regions visited. The marine algae secured during the expedition are represented by 713 collection numbers, embracing, perhaps, 4,000 specimens.

Respectfully submitted,

MARSHALL A. HOWE,

Curator.

CONFERENCE NOTES.

At the regular meeting of the conference of the scientific staff and students, held in the library of the museum of the New York Botanical Garden, April 7, Mr. B. T. Butler presented the paper of the afternoon on "Collecting in the Flathead Region, Montana." The paper was illustrated by numerous photographs and specimens. The following abstract was prepared by the author:

The University of Montana has a biological station situated at the town of Big Fork on the northeast shore of Flathead Lake at the mouth of the Swan River. This is one of the richest botanical fields to be found anywhere. In early summer, rains are plenty and the entire country is an immense flower garden. One is astonished at the abundance of each species and at the lavish display of form and color.

On my first visit to this region several years ago, I did not visit the station but remained to the southwest of the lake. It was about the first of June and valleys, hillsides and every open place in the forests were one mass of bloom. Species of lupine were very abundant, looking from a distance as if the hills were covered with a lilac carpet. Some of the wet meadows were blue with the Indian camas, wild onion and death camas mingling tints of purple and yellow with the bright green of grasses and

rushes. The drier hills were covered with the large leaves and fading yellow flowers of the wild sunflower or arrow-leaf, while along the shores of the lake, the balsam cottonwood and the aspen were common.

Species of willow were found everywhere along the lake and bordering the streams and ponds. The hills and mountain slopes on both sides of the lake are heavily timbered. On the west lie rounded hills rising higher and higher as you leave the lake, forming the foot-hills of the Cabinet Range lying to the northwest. On the east the Mission Range extends almost due north and south, rising more or less steeply from the lake shore and reaching its highest elevation some miles south of the lake, being lowest at its northern extremity at Big Fork.

The prevailing timber on the west of the lake is made up of the yellow or bull pine, the red or Douglas spruce and the western larch or tamarac, with the Lodgepole pine on the higher slopes. In one of the stately yellow pine forests I found the yellow moccassin-flower growing very luxuriantly in great masses as far as one could see. On a moist slope where ferns and mosses were abundant, the fragrant lady's-slipper was found growing in large clumps over a foot high and with usually three large blossoms on a stem. The dainty little Venus' slipper was found at the highest altitude in the Lodgepole forests. The black haw, red cedar and ninebark were common along the lake shore, the latter converting the rocky slopes into masses of white. The mock orange or syringa was found just coming into bloom on the steep, rocky banks of the Pend l'Oreille River, the outlet of the lake to the south.

During the past summer about six weeks were spent in this region, beginning July 15. Our headquarters were at the station at Big Fork and most of our collecting was to the east and northeast of the lake. In the party were Dr. M. J. Elrod, of the University of Montana, Professor Marcus E. Jones, of Salt Lake City, Mrs. Joseph Clemens, of Fort Douglas, Utah, Miss Gertrude Norton, of Salt Lake City, and Miss Carrie M. Green, of Kalispel, Montana, who were more especially interested in plant study.

The timber about Big Fork is chiefly yellow pine, Douglas spruce, western larch, white or lowland fir, Columbian spruce, western or yellow birch (the western form of paper birch) and balsam cottonwood. Among the smaller trees and shrubs were dwarf maple, black haw, alder, red cedar, low juniper and species of willow and wild rose. The wild syringa was in full bloom on our arrival, the large waxy-white flowers borne in clusters in great profusion vieing with a species of *Holodiscus* and a *Spiraea* in being the most conspicuous object in the woods. The latter, having large, plume-like panicles of small, white flowers fading to cream-color then yellowish-brown, forms large, graceful shrubs several feet tall, usually occurring in clumps. The nine-bark, service-berry, silver-berry, choke-cherry, thimble-berry, prickly currant and gooseberry were common. The latter, which was found with fruit nearly black, or sometimes wine-colored and in some cases a clear golden-yellow-brown, was mildly sour and decidedly good to eat. They may possibly prove to be different species.

The buckthorn, from which *Cascara Sagrada* is made, was not common but occasional here and also at Ravalli. The beautiful trumpet honeysuckle was one of the attractive features of the deep woods. Mountain alder was found with white cedar, silver pine or white pine, Lodgepole pine and dwarf yew a few miles east of Big Fork along the Swan River.

The highest elevation at which we collected was on Mt. MacDougal (7,500 feet), which we visited on July 31. This gave us a range of 4,500 feet in elevation from the lake level. The way lay mostly through heavy timber with occasionally a small lake or swamp. The silver pine became more abundant as we neared the mountains and Lodgepole pine, western larch and balsam cottonwood were found extending far up the slopes. Our trail up the mountain sides was through a "burn" thickly overgrown with Jersey tea. Three species of huckleberries, which were delightfully refreshing, were abundant, the two large, purple-fruited ones and the low red, small-fruited species. Balsam or Alpine fir, Englemann's spruce, Alpine pine and Alpine juniper were found on the highest elevations.

Snow was still found on the northern slope of the rocky ridge which forms the top of the range at this point, and the moist ground even to the edge of the snow was a carpet of brilliant flowers. Around the little lakes and along the tiny streams the dark red monkey-flower was just coming into bloom. Hoary anemone was common, mingled with species of buttercup, and shooting stars were very abundant. Yellow columbine growing in low clumps and surrounded by the brilliant purple candytuft and glowing yellow sulphur-plant reached the highest peak. This was the only place where the shrubby five-finger (*Dasiphora fruticosa*) was found.

Time will hardly permit the mention of even the most noticeable and striking features of the flora of this magnificent country. Many new species were found during the summer and many others not before reported from Montana. Among the latter were sweet flag (*Acorus Calamus*), Sandberg's birch (*Betula Sandbergi*), the Utah birch (*Betula utahensis*) and several species of *Crataegus*.

FRED J. SEAVER.

SUMMER EXHIBITION OF THE HORTICULTURAL SOCIETY OF NEW YORK.

The Horticultural Society of New York will hold its summer exhibition of plants and flowers in the basement of the Museum Building of the Garden on the afternoon of Saturday, June 5, and the exhibition will remain open to the public during Sunday, June 6, until 5 o'clock in the afternoon.

Prizes are offered for the best exhibits of peonies, hardy roses, flowering shrubs and trees, hardy rhododendrons and azaleas, and hardy herbaceous plants and irises, as well as for any meritorious exhibits of other hardy plants or flowers.

In accordance with the previously announced course of public lectures for Saturday afternoons, Dr. W. A. Murrill will speak at 4 o'clock on the "Selection and Care of Shade Trees."

At 5 o'clock, opportunity will be provided for viewing the new public conservatories of the Garden, recently built; Mr. George V. Nash will escort the party, leaving the Museum Building at that time.

The complete program for this exhibition and the rules and regulations governing it are now being printed and will be distributed to all members of the Garden.

NOTES, NEWS AND COMMENT.

The spring course of lectures and demonstrations to the 4B and 5B grades of the public schools of the Bronx, comprising fifteen lectures, began April 22.

Dr. J. K. Small, head Curator of the museums and herbarium, visited Washington late in April to examine specimens of the Malpighiaceae family which he is monographing for "North American Flora."

Dr. M. A. Howe, Curator, lectured before the Barnard Botanical Club, April 23, upon "The Plant Life of the Sea."

Seventy-one packets of Japanese polypores were recently received for determination from Professors S. Kusano and S. Nohara, of Tokyo Imperial University. This collection is the first of any importance to reach us from Japan, and it will throw light on the distribution of a number of species. A detailed account of it will shortly appear in Mycologia. The specimens will become a permanent addition to the Garden herbarium.

Miss Emilia Noel, a granddaughter of the Earl of Gainsborough and a member of the Linnean Society of London, visited the Garden on April 22. She has traveled in central Africa in connection with her botanical studies. While in this country she expects to visit the Grand Cañon of the Colorado, Yellowstone Park, California, and various botanical laboratories and museums.

Professor Edward C. Jeffrey, of Harvard University, visited New York during the latter part of April and spent four days in field work with Dr. Arthur Hollick, collecting lignites in the Cretaceous clays of New Jersey and Staten Island. Further interesting material of this kind was thus added to the museum collection.

A tour of the conservatories at the present time would repay the observer with a view of many interesting and showy plants. In house no. 1, in which the large palm and cycad collections are located, is that novel plant, *Stangeria eriopus*, to which attention has been called before. The cone is now well developed. In southern Africa, where it is native, it is known as the Hottentot's head. In house no. 2 many of the attractive members of the arum and pine-apple families may now be seen, some of them gorgeous in their bright colorings. In no. 4, in addition to the always interesting bananas, may be seen, in the glory of its bloom, that attractive shrub of the Philippine Islands, *Medinilla magnifica*. A large specimen and a smaller one, the latter more fitted to the requirements of the ordinary private greenhouse, are bearing in great profusion their large masses of bright pink blossoms. In this house also is Roxburgh's fig, *Ficus Roxburghii*, from Burma and the Himalayas, with its large masses of depressed fruit borne in clusters near the base of the trunk. Another plant is here, interesting on account of its economic importance. This is the chocolate tree, *Theobroma Cacao*, now with a single developing fruit, a condition in which it is not often seen under glass. In no. 5 the desert plants from southern Africa are at the height of their season. The members of the genera *Aloe*, *Gasteria* and *Haworthia* make the bench on which they are placed very attractive, many of the aloes being especially gorgeous. In no. 13 the bottle-brush tree, *Callistemon citrinus*, from Australia, is just donning its mantle of bright flowers, the odd shape of its inflorescence giving to it the popular name. A little further on one is greeted with the delicious perfume of the Tobira, *Pittosporum Tobira*, another Australian plant. Still further on are plants of the palm genus *Trachycarpus*; *T. Fortunei*, now just passing out of flower, a native of northern and central China, and *T. excelsus*, the Japanese representative, now at its height, with great masses of rich golden-yellow flowers borne among the leaves. In no. 15 the tropical orchids hold sway, and here may be seen at any time many plants of interest and attractiveness from all parts of the tropical world.

Meteorology for April. — Total precipitation for the month was

6.13 inches, including a light snow-fall on the 29th. Maximum temperatures were recorded of 61.5° on the 1st, 77.5° on the 7th, 65° on the 13th, 85.5° on the 19th, and 61° on the 26th. Also minimum temperatures were recorded of 23.5° on the 11th, 36° on the 16th, 31.5° on the 25th, and 32.5° on the 29th. The mean temperature for the month was 54.5°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

16 ferns from Vermont. (Given by Miss Margaret Slosson.)

1 specimen of *Sphagnum Bartlettianum* from Georgia. . (Given by Mr. H. H. Bartlett.)

50 specimens, "Ascomycetes," fasc. 42 and 43. (Distributed by Prof. Rehm.)

2 specimens of rusts. (Given by Mr. E. W. D. Holway.)

5 ferns from Staten Island, New York. (Given by Prof. Philip Dowell.)

593 specimens of flowering plants from Arizona. (Distributed by Mr. J. C. Blumer.)

217 specimens of flowering plants from the Old World. (By exchange with the Museum of Natural History, Paris.)

17 ferns from the eastern United States. (Given by Mr. R. C. Benedict.)

3 specimens of Malpighiaceae from Mexico. (By exchange with the University of California.)

28 specimens of ferns from New Jersey. (Given by Mr. Macy Carhart.)

200 specimens, "Kryptogamae Exsiccatae," Cent. 15 and 16, for the Columbia Herbarium. (By exchange with the K. K. Naturhistorisches Hofmuseum, Vienna.)

44 specimens of flowering plants from Florida. (By exchange with Mr. C. C. Deam.)

1 fern from Ohio. (Given by Mr. J. H. Schaffner.)

508 specimens of flowering plants and ferns from Mexico. (Distributed by Dr. C. A. Purpus.)

248 specimens of flowering plants from Georgia and Alabama. (By exchange with the United States National Museum.)

1 type specimen each of *Nectria grammicispora* and *Sphaerostilbe intermedia*. (By exchange with the University of Copenhagen.)

3 specimens of Philippine polypores. (By exchange with Rev. G. Bresadola.)

72 specimens of woody fungi, mostly polypores, from Japan. (By exchange with Tokyo Imperial University.)

1 specimen of *Panaeolus* from South Carolina. (Given by Dr. H. H. Rusby.)

113 specimens of miscellaneous fungi, from Guadeloupe, W. I. (Collected by Père Duss.)

PLANTS AND SEEDS.

155 packets of seeds. (By exchange with La Mortala Gardens, Italy.)

1 packet of seed from China. (Given by Dr. H. H. Rusby.)

6 tubers of *Caladium* sp. from Florida, for conservatories. (Given by Miss Roddie Minor.)

2 packets of hickory-nuts from Van Buren, Arkansas. (Given by Dr. R. T. Morris.)

19 plants for conservatories. (By exchange with Mr. H. I. Pratt.)

1 night-blooming *Cereus* from Cuba. (Collected by Dr. J. A. Shafer.)

2 plants of *Coelococcus amicarum* for conservatories. (By exchange with Bureau of Plant Industry.)

117 plants for conservatories from Cuba. (Collected by Dr. N. L. Britton.)

6 plants, varieties of Bananas, from Surinam, S. A. (By exchange with United Fruit Company, Surinam Division.)

6 plants for conservatories from Florida. (Collected by Dr. N. L. Britton.)

2 plants of *Cattleya labiata Trianae* for conservatories. (By exchange with Mr. J. A. Manda.)

4 plants for conservatories from Jamaica. (Collected by Dr. N. L. Britton.)

5 plants of *Vitis quadrangularis* from Philippine Islands. (Given by Dr. C. B. Robinson.)

110 plants, mostly ferns, for conservatories. (Given by Mr. L. M. Palmer.)

6 plants for conservatories from Key West, Florida. (Collected by Dr. N. L. Britton.)

22 plants derived from seed from various sources.

2 plants of *Clematis* from South Carolina. (Collected by Dr. H. H. Rusby.)

13 plants for conservatories from Cuba. (Collected by Dr. J. A. Shafer.)

6 plants for conservatories from Jamaica. (By exchange with Dep't of Agriculture, Jamaica, West Indies.)

9 plants for conservatories. (By exchange with Mr. Frank Weinberg.)

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EDITOR

PERCY WILSON

Administrative Assistant

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OF

The New York Botanical Garden

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RESEARCH FACILITIES AT THE GARDEN IN CO-OPERATION WITH COLUMBIA UNIVERSITY.

A description of the facilities for research at the Garden was published in this JOURNAL for January, 1904. The numerous changes which have been made, together with the steady growth of equipment for investigation in the various phases of botanical work, make it desirable to publish a revision of the statement at this time.

The four years since the date mentioned above has been a period of growth in all directions. The library, which at that time contained something over 14,000 volumes, has been increased to more than 21,000. This includes books and periodicals which are devoted entirely or for the most part to botanical work, including horticulture, agriculture and forestry. These facilities are still further extended by the opportunity afforded students for consultation at other New York libraries.

The herbarium has been extended in the same length of time by the addition of more than 200,000 specimens, including representatives of all of the various groups of the plant kingdom, which brings the total up to more than 1,500,000 specimens. With its present equipment, the herbarium affords unusual opportunities for special taxonomic work on any of the plant groups, either phanerogamic or cryptogamic. The collection of living plants has also been proportionately extended by the addition of species from various parts of the world, especially from tropical America. In order to accommodate these additional tropical plants new greenhouses have just been constructed.

The equipment of the laboratories for work in morphology, physiology, physiological chemistry, or culture work with the fungi, including pathological studies, has also been extended to meet the demand of students desiring to carry on investigations along these lines.

The tropical laboratory at Cinchona, in Jamaica, in coöperation with the Department of Agriculture of Jamaica, offers opportunity for those who care to carry on investigations with the plants of that region. The elevations within reach of Cinchona range from sea level to over 7,000 feet, offering a large variety of conditions within a comparatively short distance.

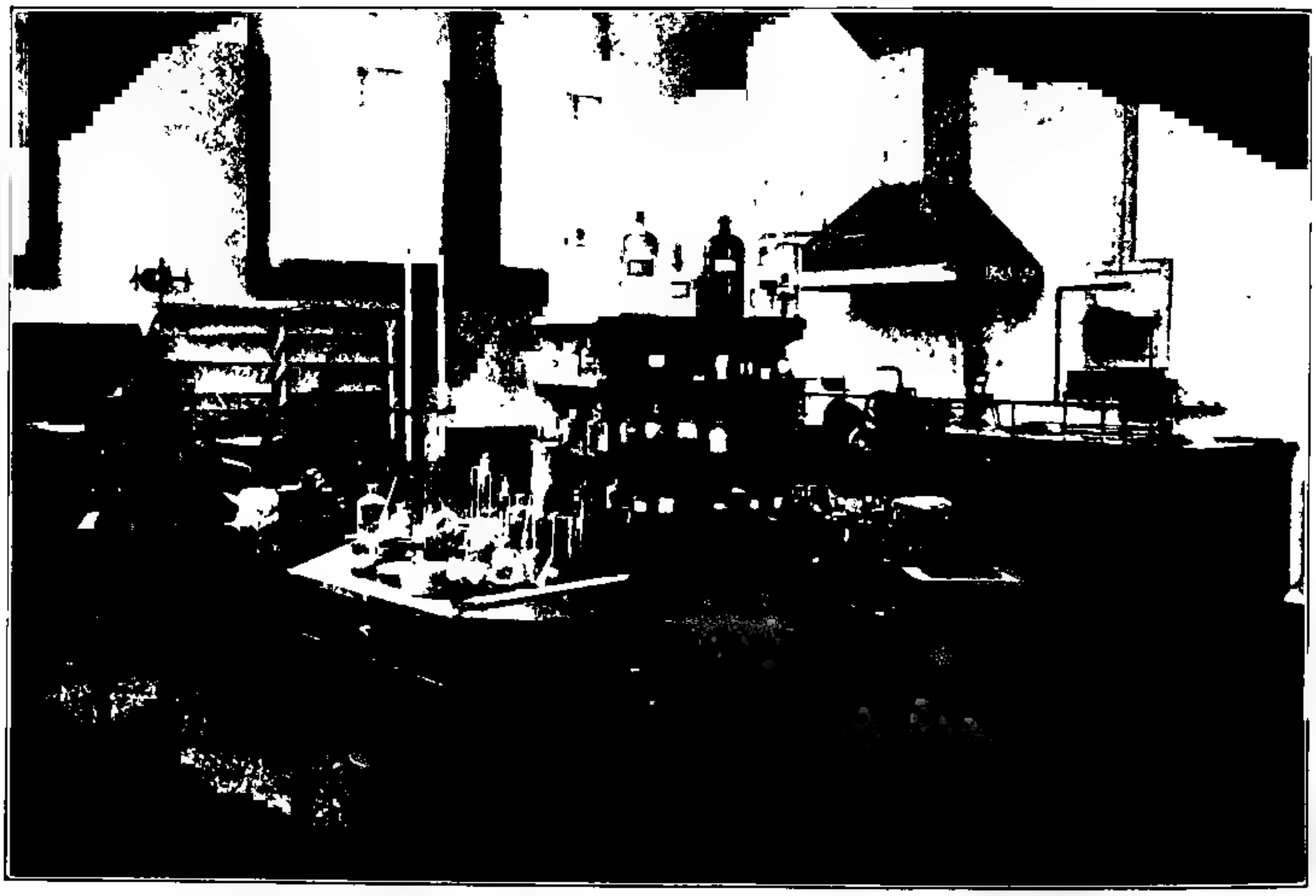

FIG. 27. THE CHEMICAL LABORATORY, NEW YORK BOTANICAL GARDEN.

Conferences are held in the library of the Garden on the first Wednesday of each month from October to May. At these meetings papers are presented by the students and members of the Garden staff containing the results of investigation accomplished at the Garden. These papers are open for discussion by members of the staff or students, as well as by visiting botanists. A synopsis of each paper presented at the monthly conference is published in the JOURNAL for the following month.

The Board of Managers of the Garden have established research scholarships of the value of $50.00 a month to each person to whom such privileges may be granted. The scholarships are designed to meet the needs of professors or instructors in colleges, officers of museums, or botanists of equivalent training or experience, who desire to utilize the facilities of the Garden for continuing investigations already begun or for carrying on investigations requiring facilities beyond their command at home.

Applications for the privileges of resident research scholarships may be made in writing to the director-in-chief. Such application should present a detailed statement of the nature of the

FIG. 28. View of Cinchona, showing the principal buildings. The laboratory is in the background almost concealed by clumps of pampas-grass. Photographed by Dr. Forrest Shreve.

investigations the applicant desires to pursue, the facilities needed, and the length of time the applicant desires to hold the scholarship. The application should give a statement of the papers published by the applicant, copies of which should be submitted if desired.

The coöperative relations between the New York Botanical Garden and Columbia University make it possible for students registered at the Garden to apply work done at this institution toward the completion of requirements for an advanced degree at

Columbia through work accomplished in any of the following subjects.

Research Subjects.

The collections of living and preserved plants and of books, the equipment and arrangement of the laboratories and herbaria, and the facilities for cultural work under glass and in the open air are organized in such manner that opportunities for research are offered in the following subjects :

Taxonomy of Algae. — The diagnostic characters and relationships of selected families and genera. Field, herbarium and laboratory. Doctor Howe ; Doctor Hazen.

Taxonomy of Fungi. — The diagnostic characters and relationships of selected families and genera. Field, herbarium and laboratory. Doctor Murrill ; Mr. Seaver.

Taxonomy of Bryophyta. — The diagnostic characters and relationships of selected families and genera. Field, herbarium and laboratory. Mrs. Britton ; Doctor Howe.

Taxonomy of Pteridophyta. — The diagnostic characters and relationships of selected families and genera. Field, herbarium, garden, conservatories and laboratory. Doctor Howe.

Taxonomy of Spermatophyta. — Study of the principal families and genera. Field, herbarium, garden, conservatories and laboratory. Doctor Britton ; Doctor Small ; Mr. Nash ; Doctor Rydberg.

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Developmental Taxonomy. — Comparative study of the living and fossil representatives of some family of plants. Laboratory and museum. Doctor Britton; Doctor Hollick.

Palaeobotany. — Developmental history and arrangement of the fossil flora of some selected locality. Study of structure of fossil plants. Laboratory, field and museum. Doctor Hollick.

Plant Geography. — Occurrence, characters and arrangement of groups of plants. Relations of plants and of plant societies to one another, and to topographic, climatic and other conditions. Factors governing distribution. Professor Britton; Professor Curtis.

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Chemical Physiology. — Problems relating to nutrition, nature of storage substances and composition of secretions and excretions. Professor Gies; Professor Richards.

Physiological Anatomy. — Problems in the relationships of

tissues and functions. Laboratory. Professor Richards; Professor Curtis.

General Physiology.— Problems in absorption, excretion, nutrition, and transformation of energy, growth, the general irritable organization of the plant, and the mechanism of its movements. Laboratory. Professor Richards; Professor Curtis.

General Pathology. — Causes of diseases of plants with special attention to the morphology of pathological organisms. Also problems in immunity, and effects of unfavorable environment. Professor Richards; Mr. Seaver.

Economic Botany. — Investigation of plant products used in the arts and sciences and of the methods employed in their production. Professor Rusby.

FRED J. SEAVER,
Director of the Laboratories.

BOTANICAL EXPLORATIONS IN NORTHEASTERN CUBA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: The *S. S. Olinda*, upon which I embarked from New York, January 13, entered Nipe Bay five days later, but her destination, Nuevitas, was not reached until January 22. On landing at Nuevitas I proceeded to La Gloria, in the province of Camaguey, in a small boat, sailing through the beautiful Marinavo Bay, now called "bay number one," the narrow Zanji, the shallow bay of Sabinal, with its mangrove-covered banks and numerous small islands, and finally the much deeper Guajaba Bay, to Porto Biaro.

La Gloria, which is situated some four miles inland across a low savanna, was reached on the night of January 23, and was made my headquarters for several weeks. It is surrounded by a dense, mostly primeval, forest with an altitude of approximately 50 feet. The village is the center of the first and oldest of the American colonization schemes, but the operations of the colonists have had very little effect upon the vast forest area. Their chief occupation has been the planting of citrus groves, which are scattered and often very far apart, consisting of from 5 to

20 acre clearings in the forest. A tract of land is cleared by chopping and burning, no attempt being made to save the timber, the young trees are then planted without further preparation of the soil, and, if cultivated for a few feet about each tree and the rank vegetation kept down, the young trees grow rapidly, while the old stumps decay and in about two years have mostly disappeared. The ground is then plowed and kept under clean cultivation, or, in some instances, smaller crops are grown between the trees. Oranges, mandarins and grape-fruit do exceedingly well and are of very fine quality. Lemons are not in favor on account of the additional work involved in curing them. As yet, the citrus industry cannot be said to be on a commercially paying basis, on account of the abnormally high rates for the very poor transportation facilities now available.

The forest, which is truly tropical, is made up of a large number of hardwood species, several others besides cedar and mahogany being of local economic value. The trees are, as a rule, densely set, usually long and slender, their tops often interwoven with a considerable variety of vines, thus shutting out the light; consequently, there is little undergrowth, the shrubs being restricted to a very few species, while herbaceous plants are rarely met with. The tree trunks and branches, however, support a rich growth of epiphytes, about twenty species of orchids having been met with as well as many bromeliads. Several cactuses also occur frequently; ferns are rarely seen; the royal palm is common, especially in the lowest and richest portions of the forest.

The savanna already mentioned, which is probably not over three miles across in either direction, has a deep, rich, black soil, covered by several kinds of wiry grass and quite thickly set with a common palmetto, some specimens of which are of very large size. Clumps of hardwood trees composed of a variety of species, many of them shrubby, are also scattered about. These clumps usually have one or two larger trees as their nucleus, the commonest being the mahogany, but the West Indian ebony is frequently the central tree of these groups, and it is also met with in isolated individuals. Mistletoes are very abundant and in great variety on these trees and bushes; a purple-flowered orchid,

Epidendrum, is also very abundant and in late February adds much color to this rather dreary region.

The low coast is fringed with red mangrove, back of which the white mangrove and the buttonwood, *Conocarpus*, predominate, the latter in the white, silky-leaved form as well as in the form with smooth, green leaves, the two varieties seemingly being connected by various intermediates. Poisonwood, *Metopium*, and black olive, *Bucida*, are also very abundant, the latter highly valued by the Cubans, who call it "Jucaro" on account of its hardness and durability. A palm, *Copernicia*, is sparingly scattered through this region, as well as many other trees and shrubs not seen farther inland, except when the two forests are joined, when one finds an intermingling of the trees common to both regions. To the westward, toward Pilota, is a large lagoon and salt marsh, but only the usual plants of such formations were observed there. About Pilota, however, the ground is somewhat higher and the forest resembles more closely that surrounding La Gloria, only in its more depressed areas it is even richer in epiphytic plants and contains many ferns.

The Maximo River, the principal stream of this region, was visited from its mouth upward. It is low and sluggish for some distance, and with the exception of occasional small slippery places, called "alligator slides," for these reptiles are quite abundant, it is fringed by the red mangrove, the predominating tree back of it being the white mangrove in very large specimens. On the whole, this region was rather disappointing, although a few plants not observed elsewhere were obtained. I also had the satisfaction of seeing the two large ferns *Acrostichum aureum* and *A. excelsum* (*A. lomarioides*) growing almost side by side, the former in clumps at the water's edge and with dimorphous fronds, the latter forming dense, almost impenetrable thickets back from the water; thus seen, one cannot doubt that they are distinct species.

The Cubitas Mountains, a narrow limestone ridge of no great elevation, approximately parallel with the north coast and about 25 miles inland, separates the wooded region above mentioned from the large dry savanna to the south. This ridge is very

rough and composed entirely of very hard perforated limestone with little or no soil, covered with a forest of small trees and shrubs consisting of much the same species that are found in the more elevated portions of the adjoining forest but they are much smaller and less abundant. The ravines which usually transverse the range are also very rough and rocky and, except after much rain, are devoid of water, the larger of them being used as "passes," through which trails are worn. That known as the "east pass" is near a magnificent cavern of great extent and the surrounding region was found to be rich in ferns, in species of *Peperomia*, and other small plants which prefer a similar environment. The "middle pass," which is deeper, with very high perpendicular walls, is even richer in these interesting plants and is a place of great natural beauty.

The savanna to the southward is of great extent, but I was able at this time to examine only a few miles of it. The soil is thin and poor, overlying a greenish rock, apparently a chlorite schist, and supports a hard, wiry grass which is largely grazed. The most conspicuous features were two lofty species of palms, the spiny-petioled *Copernicia* and the silvery-leaved *Coccothrinax*, which are in great abundance and much intermingled. A smaller palm with soft, almost herbaceous leaves thickly coated with a waxy substance underneath, the long panicles of unripe fruit indicating that it is probably a species of *Copernicia*, was found in only a few clumps. Numerous spiny shrubs were scattered about, usually in small clumps, and many other smaller plants were found among the grasses.

One of the objects of this trip was to ascertain if there is any closer relationship between the Cuban and the better known Bahamian flora than hitherto ascertained, but up to this point in my explorations there seemed to be very little similarity. An examination, however, of two of the chain of islands stretching along the north coast from Nuevitas to Cardenas, none of which, presumably, had ever been visited by a botanist, revealed a very different flora, which is probably quite Bahamian in its composition.

Cayo Guajaba, across a bay of the same name and just north of the mainland upon which I have reported above, is about fifteen

miles long and scarcely one half as broad. Its southern side is made up of a series of small, flat islands and low, mangrove-fringed shores, with shallow "salinas" inside. The interior toward the north is more elevated and broken up by low hills, none of them, probably, exceeding a height of 200 feet. The formation is rather soft coralline limestone. I succeeded in touching this region at two different points and secured a fairly representative collection of plants, but the highest and most westerly portions I was not able to reach. Two small Bahamian trees common here and not reported from Cuba, are *Acacia coriophylla* and *Jacquinia keyensis;* also a small specimen of the hog cabbage palm, *Pseudophoenix Sargentii.* In this latter identification I was corroborated by a Bahamian negro who seemed familiar with this palm and its peculiar economic uses. He also stated that a dozen or more large specimens existed toward the western end of this island.

The Sabinal, which is the easternmost of the chain of islands, is an aggregation similar to Cayo Guajaba, but is much larger, and its northern higher portion, which is made up of a harder limestone rock, is very low and flat. The extreme northwestern point is pure white sand, extending southward along Carabelas Channel for probably half a mile; to what extent it occurs along the sea to the eastward I was unable to ascertain in the limited time at my disposal there, but the name Punta Arenas would seem to indicate that it was an unusual formation for that region of the coast. A tall palm, probably a *Thrinax*, and fine trees of the Joe-wood, *Jacquinia keyensis*, were conspicuous objects in the flora, which differed markedly from that of any other region seen on my entire trip. A nearly prostrate *Chrysobalanus* said to bear white fruit was widely different in appearance from the black-fruited Icaco seen on the edge of the forest on the mainland. A small, low hill surrounded by a limited area of palmetto-covered savanna on the southwestern end, is probably the highest point on this island. The bulk of the island, however, is covered with low forest composed largely of small trees of the pigeon plum *Coccolobis laurifolia.* In this forest one finds many small openings containing palmetto, *Pithecolobium*, or *Acacia coriophylla;*

while in the forest itself is seen an occasional columnar cactus, often 12 to 15 feet high, and scattered specimens of *Copernicia*. In one place many small plants of *Furcraea* were seen. The eastern end, along the Nuevitas Channel, is also rocky and flat, but the growth for several miles inland is one of low shrubs, many of them spiny, some of which were not seen elsewhere. Along the sea for several miles is a dense thicket of shrubby sea-grape, *Coccolobis Uvifera*, with an occasional clump of the bay-cedar, *Suriana*, while back of this is an extensive salina. From Nuevitas, to which I had shifted my headquarters about March 15, I made excursions mostly by sailboat, to various points about the bay, all of which afforded much additional material. The peninsula upon the neck of which the city is built, known as the Pastelillo, is rough and hilly, and, on account of its porous lime-stone formation, is quite dry. This contained many trees and shrubs that had not been collected by me elsewhere. The two larger of the three small islands in the bay were found to be quite similar to the Pastelillo. A fresh-water lagoon at Atalaya was found to be rich in trees and shrubs seldom met with elsewhere in this region.

The extensive palm barrens northward along the railroad to Camaguey were explored, and the waxy-leaved palm already noted was detected several miles east of Minas, where it became arborescent, with a trunk often 6 feet tall. No stops for collecting were made between Camaguey and Cococum, but several promising stations were noted in this region.

Holguin, where I collected plants during most of April, is on a dry plateau encircled by high eruptive hills or mountains that have been made bare by frequent burnings, but their gullies and rocky places harbor a distinct vegetation not seen by me at any other point. It is largely composed of spiny shrubs, growing in impenetrable thickets, while on the tops of some of the highest mountains one finds the maguey and a columnar cactus similar in appearance to the one seen on the coastal islands, but one can scarcely believe that it is the same species. On the sides of these hills a small palm, probably a *Thrinax*, which I have not seen elsewhere, is sparingly persistent, but it is evident that the

fires will eventually exterminate it, as there are many charred remains, but very few young plants to be seen. The surrounding savannas are rocky palm barrens, the Yaray de Savanna occurring in forest-like abundance, with many spiny shrubs in the rocky places. This region has numerous springs and moist swales, and along these a very interesting variety of plants, some large trees and many shrubs and herbs, thrive in luxuriance. Most of these were seen in no other place, but some of them occur farther along the streams and rich valleys into which the streams flow and in which one finds some dense and interesting forests. Outlying the eruptive hills and valleys, one encounters low limestone hills with much scrubby vegetation upon them, and barren valleys covered with a dense growth of the palm known as Daraguana, a silvery-leaved *Coccothrinax*, the young leaves of which are largely used in this part of Cuba in the manufacture of rope.

Gibara, a seaport town south of Holguin, was visited for the purpose of examining the coastal flora at that point, but not much of special interest was discovered there, although some collecting was done between there and Holguin.

Cacocum, on the railroad, was visited to secure a palm of peculiar appearance seen from the car window. It proved to be the Cuban Yaray, a species of *Copernicia*, the leaf fibers of which are woven into hats and baskets; brooms are also made of it and it is commonly used as a substitute for twine, even by American settlers.

Alto Cedro, a miserable railroad junction town, was visited on account of the dense forest surrounding it; but it was found that the forest could be more comfortably examined at Paso Estancia, which also offered an opportunity of examining the vegetation on the Cauto River, and proved to be a convenient point from which to reach the Pinales of the Sierra Nipe, a range of eruptive and limestone hills running north and south and probably the most eastern location on the north side of the island for the pine tree of eastern Cuba.

The Pinales were reached by traversing a rough, mostly wooded territory eastward from Paso Estancia for about fifteen miles, which proved a very interesting region, but lack of time

prevented me from making any collections there. The pine trees occur on the tops of mountains about 1,500 feet in height, growing in a red, pulverulent soil, said to be rich iron ore. They are very much scattered, and some have reached a height of 75 or 80 feet, with a trunk diameter of 2 feet. The species is probably *Pinus cubensis* of Grisebach. Among these pines a number of peculiar shrubs are met with, but the moist ground in the depressions affords a great variety of plants not seen elsewhere, among them many kinds of trees and shrubs, two palms, a tree-fern, several climbing ferns, and many herbaceous plants, including a large terrestrial orchid.

Nipe Bay was reached on the afternoon of the fourth of May, and a trip was taken out to the mouth of the narrow channel and the shore was examined for several miles on either side of the channel and for a short distance along the ocean. This hurried trip resulted in the discovery of the large tree cactus *Cereus nudiflorus*, a specimen of which was fully 30 feet tall, with an equal spread, its well-formed trunk being two feet in diameter; only three individuals were found after a careful search, one of them bearing a few flower buds. An arborescent specimen of the bay cedar with a trunk fully 6 inches in diameter was also noted. Returning from this trip, I had but a few hours in which to board the *S. S. Curityba*, which brought me to New York on the evening of May 12.

I have not related various personal experiences, agreeable or otherwise, that usually fall to one's lot in a sparsely settled region, especially when one is not very familiar with the language of the people; but it would seem proper to state that I met with no serious mishap and that I enjoyed the advantages afforded by the presence of American colonists whenever practicable; and that much of the success of the expedition is due to the kindly interest and hospitality shown by them.

Respectfully submitted,

J. A. SHAFER,

Museum Custodian.

A RARE MOSS IN THE CONSERVATORIES.

It is almost impossible, and in many cases undesirable, to keep the pots in the greenhouses free from various mosses and hepatics ; many plants grow better in wet moss or on peat, notably certain orchids and ferns. Among the mosses in the large greenhouses of the New York Botanical Garden there have been several species which are quite common and have been brought in from the garden, especially *Catharinea angustata*, *Physcomitrium turbinatum* and *Leptobryum pyriforme* as well as the ubiquitous, often iniquitous, *Marchantia !*

But besides these familiar ones there are a number of rarer mosses and hepatics which do not grow elsewhere within the limits of the Garden and have probably been brought in either by spores or attached to plants introduced from the tropics. On one of the palms in the cool house (no. 13) there is a thriving and most interesting colony of a beautiful tropical genus *Hypopterygium* and in the orchid house (no. 15), on one of the pots of the *Venus-slipper* orchid, *Paphiopedilum*, I discovered on January 9 of last year a small fruiting moss which proves to be a species of a rare tropical genus, *Splachnobryum*, probably the same as the species which was described by Mr. H. N. Dixon in the Journal of Botany for 1907, from plants grown in warm forcing-houses in England, also in a collection of orchids. Three times previous to this other plants of the same genus have been found in greenhouses, first at the Botanical Gardens at Glasnevin, Scotland, in 1872, then in Cherbourg, France, in 1902, and in England in 1904. Our record is the fourth, but ranking second in importance, for only one previous collection has been found fruiting. Ten species of this genus have been described from tropical America ranging from the West Indies to Peru and Chile, but it is very doubtful whether all these will stand the test of critical study and comparison.

The plants are generally minute, matted together by brown rootlets, with small blunt leaves, usually entire, with the vein ending below the apex and the fruit erect on a slender terminal stalk. The peculiar character of the capsule is that its mouth

is bordered by a thick dark-colored rim of cells and the teeth are deeply inserted below this rim. It is probable that all the species described from cultivated plants will prove to be some one of the West Indian species, native to Cuba or Jamaica, or else South American in origin.

ELIZABETH G. BRITTON.

CONFERENCE NOTES.

The last regular conference meeting of the academic year just closed was held in the library of the Garden on May 5 and was presided over by Dr. W. A. Murrill.

Dr. Arthur Hollick discussed the subject of botanical supplies in the public schools of the city, with special reference to the matter of the destruction of wild flowers indicated in the list of supplies for high schools and training schools, and recent efforts which have been made to replace them with cultivated ones.

In the list for 1907 some thirty species were included, all of which should be protected. Agitation of the subject resulted in the elimination of a majority of these from the list for 1908, but a number yet remain. Following is a list of these with the number of specimens supplied during the school year 1907–08, and the cost of each item :

	No. of Specimens Supplied.	Cost.
Aspidium marginale Sw	431	$21.30
Polypodium vulgare L.	425	31.50
Salamonia biflora (Walt.) Britton	318	26.50
Aquilegia canadensis L.	36	1.05
Geranium maculatum L.	500	8.75
Erythronium americanum Ker	1,100	19.25
Gentiana crinita Froel	1,600	40.00
Arisaema triphyllum (L.) Torr	288	8.40
Caltha palustris L.	1,800	31.50
Cypripedium acaule Ait	180	11.25
Trillium sp	2,500	62.50
Wild orchid sp	36	1.80
	9,414	$263.80

Steps are being taken to substitute cultivated for wild flowers wherever possible and the farm and grounds of the recently

established Parental School on Long Island are being in part planted and developed with that end in view, so that the Department of Education may grow and distribute as many as possible of the items of botanical supplies required in the public schools.

Dr. Hollick suggested that if those who are interested in the matter of the preservation of our wild flowers would write to the Board of Education, asking that everything possible be done to eliminate wild flowers from the list of supplies, it would have the effect of hastening the end in view.

Mr. Nash exhibited for the second time before the conference the specimen of *Stangeria eriopus*, to show progress in the development of the cone which was just forming when first exhibited. It has now developed so that the pistillate character of the cone is evident from its ovoid shape. The staminate cone is much longer and cylindric. Mr. Nash again called attention to the pinnate venation of the leaflets of this odd plant, a character unique in the family Cycadaceae, for all the others have parallel venation. The leaves much resemble those of a fern, and in the absence of the cone this plant was first described as a Lomaria.

A collection of polypores from Japan was exhibited by Dr. W. A. Murrill, who spoke briefly of our meager knowledge of Japanese fungi and the desirability of further material from that region, as throwing light on the distribution of temperate species. The collection consists of 72 numbers, containing 44 species, 26 of which occur throughout the North Temperate Zone, 2 are Eurasian, 8 are oriental, 3 are known Japanese species, and 5 are undescribed. A detailed account of this collection will be published in MYCOLOGIA. Professors Kusano and Nohara, who sent these specimens for determination, are planning to collect fungi in various parts of Japan on a larger scale.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Mr. Oakes Ames has been appointed director of the Harvard Botanical Garden to fill the position recently made vacant by the retirement of Professor George L. Goodale after thirty years of active service.

Prof. W. C. Coker, of the University of North Carolina, is in residence at the Garden carrying on further investigations on the flora of the Carolinas.

At the annual meeting of the Horticultural Society of New York, held on May 12, Mr. George V. Nash, head gardener, was elected secretary.

Mr. Norman Taylor, assistant curator, delivered an illustrated public lecture on the care and protection of trees, at Yonkers, New York, on Friday evening, May 7. The lecture was given at the suggestion of the Civic League, which is starting a campaign for the benefit of the trees of Yonkers.

Eight specimens of African rubber plants and rubbers were recently presented to the Economic Museum by Mr. I. H. Hunicke, who has traveled extensively in eastern Africa.

Mr. J. J. Carter, of Pleasant Grove, Pennsylvania, who accompanied Dr. Small in several exploring expeditions to southern Florida recently spent several days at the Garden.

An important and interesting paper on the Timbers of Jamaica was recently contributed by Mr. William Harris, of Hope Gardens, to the West Indian Bulletin (9: 297–328. 1909).

The Dutchess County Horticultural Society visited the Garden on Thursday, May 27, arriving about noon. Between forty and fifty members were expected, but owing to the inclemency of the weather only twenty-seven came. Starting with the large conservatories, various parts of the grounds were visited, including the pinetum, herbaceous grounds, hemlock forests, new conservatories, fruticetum, and museum building.

The recent course of fifteen lectures to the pupils of the 4 B and 5 B grades of the public schools of the Borough of the Bronx was attended by 8,500 children, accompanied by 280 teachers. Only two lectures were postponed on account of inclement weather.

Mr. Fred J. Seaver spent May 6 in the Museum of Natural History at Philadelphia looking over types of fungi in the Schweinitz collection. Nineteen types were examined and per-

manent slides of the spores made for future study, and numerous other specimens in the same collection were examined less critically. A few of the specimens desired were missing from the collection.

The recently issued administrative report of the Missouri Botanical Garden, and an announcement of Washington University concerning the Henry Shaw School of Botany, indicate that the Shaw foundation is about to enter upon much increased activity. Last year a well designed fireproof building of about 12,000 square feet of floor space was put up. A part of this is being furnished in steel for stack purposes, and the remaining — and larger — part is being equipped for laboratory use. It is now announced that a definite step toward the fuller development contemplated by the founder and planned by the director has been taken in the establishment of the post of plant physiologist at the Garden, and the creation of a professorship of plant physiology and applied botany in the Shaw School of Botany, with provision for two research fellowships in botany. To the new professorship, Dr. George T. Moore has been called, as possessing to an unusual extent the desired combination of established reputation, breadth of view, and expert appreciation of the economic applications of botany. The research fellowships are open to capable graduate students, and are believed to offer unusual opportunities for the productive use of talent in investigation. The library (58,538 books and pamphlets), herbarium (618,872 specimens) and garden (11,464 living plants) furnish the necessary facilities for the most advanced investigation, and the work in the School of Botany is to be so planned that the individual needs of students engaging in research will be met in every way possible, while leading to the customary degrees.

Vol. 3 of the Memoirs of the New York Botanical Garden, "Studies of Cretaceous Coniferous Remains from Kreischerville, New York," under the joint authorship of Dr. Arthur Hollick, of the New York Botanical Garden, and Dr. Edward Charles Jeffrey, of Harvard University, was issued May 20. The volume contains 138 pages of text and 29 plates. The material described was obtained by the authors from the cretaceous deposits at

Kreischerville on Staten Island. It consists of leaf impressions, lignites, lignitic débris and amber. The leaf impressions are all of well recognized species; the lignites and smaller fragments represent for the most part new species which were determined by sectioning and microscopical examination of the internal structure.

Meteorology for May. — The total precipitation for the month was 1.33 inches, the month being characterized by many light showers and much cloudy weather but with the total precipitation light. Maximum temperatures were recorded of 87° on the 6th and 14th, 72° on the 18th and 86.5° on the 31st. Also minimum temperatures were recorded of 44° on the 5th, 40° on the 12th, 43.5° on the 23d and 45° on the 26th. Mean temperature for the month was 63.5°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

20 specimens of fungi from Ohio. (Given by Dr. B. Fink.)

25 specimens "Fungi Utahensis," fasc. VII. (Distributed by Prof. A. O. Garrett.)

2 specimens of *Camptosorus rhizophyllus* from Pennsylvania. (Given by Mr. Arthur S. Haines.)

43 specimens of woody plants from the New York Parental School, Jamaica, Long Island, New York. (Collected by Mr. P. Wilson.)

25 specimens "Lichenes Suecici Exsiccati," fasc. V. (Distributed by Dr. G. O. A. Malme.)

1 specimen of *Collybia platyphylla* from New Rochelle, New York. (By exchange with Mr. W. H. Ballou.)

7 specimens of polypores from Java. (By exchange with Rev. G. Bresadola.)

1 specimen of *Lycoperdon* from Jamaica, W. I. (Given by Mr. W. Harris.)

1 specimen of *Clathrus cancellatus* from Jamaica, W. I. (Collected by Dr. M. A. Howe.)

2 specimens of polypores from the Philippine Islands. (By exchange with Rev. G. Bresadola.)

10 specimens of fungi from the Cairi River region, Brazil. (Collected by Messrs. Weiss and Schmidt.)

72 specimens of flowering plants from Jamaica, W. I. (Given by Mr. W. Harris.)

1 specimen of *Lasiocarpus salicifolius.* (By exchange with the University of Copenhagen.)

2 specimens of *Brysonima* from Mexico. (By exchange with the Natural History Museum, Paris.)

1 specimen of *Limodorum graminifolium* from Florida. (Given by Prof. C. Clyde Fisher.)

8 specimens of fungi from Florida. (Given by Mr. H. S. Fawcett.)

10,500 herbarium specimens from Jamaica, Cuba and Florida. (Collected by Dr. and Mrs. N. L. Britton, Dr. M. A. Howe and Dr. J. A. Shafer.)

126 specimens of mosses from the East Indies. (By exchange with the Bureau of Science, Manila.)

2 specimens of flowering plants from Washington. (Given by Mr. R. C. Benedict.)

PLANTS AND SEEDS.

34 plants from Cuba, for conservatories. (Collected by Dr. J. A. Shafer.)

3 plants of *Agave zapupe*, for conservatories. (By exchange with the Missouri Botanical Garden.)

2 plants of *Toluifera perierae*, for conservatories. (By exchange with the Bureau of Plant Industry, U. S. Dept. of Agriculture.)

1 plant of *Epidendrum* sp., from the Isle of Pines. (Given by Dr. H. H. Rusby.)

5 cacti, from California, for conservatories. (Given by Mr. W. F. Schaller.)

324 packets of seed. (By exchange with the St. Petersburg Botanical Garden.)

1 packet of spores of *Dennstaedtia flaccida*, from Java. (Given by Mr. F. H. S. Conard.)

1 tuber of *Dioscorea* sp., from the Azores. (Given by Dr. H. H. Rusby.)

1 packet of seed of *Arisaema* sp., from Cuba. (Collected by Dr. J. A. Shafer.)

1 packet of seed of *Tribulus terrestris*. (Given by Dr. H. H. Rusby.)

1 packet of seed of *Coccothrinax* sp., from Cuba. (Collected by Dr. N. L. Britton.)

1 packet of seed of *Allium giganteum*. (By exchange with the Bureau of Plant Industry, U. S. Dept. of Agriculture.)

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EDITOR

PERCY WILSON

Administrative Assistant

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THE PASSING OF THE WILD FLOWERS.*

AN INVESTIGATION OF THE PROBLEM OF NEW YORK CITY.

The wild flowers in the vicinity of New York City are doomed! They are perishing before the advance of the city and their most loyal friends are powerless to save them. Long since they disappeared from the older parks, and in the newer parks they are being exterminated as fast as the people who "love them" are able to accomplish it. In Van Cortlandt and Pelham Bay and Crotona Parks, they are being slaughtered by their loving friends and carried off by the armful; "If I do not get them, somebody else will," is the universal cry.

The day is not far distant when thousands of human beings will be unable to form any conception of the country with its native trees and flowers and birds. The children not only will be ignorant of nature, but they will grow up without the power to form mental pictures and thus will be deprived of much that is best in literature. In this deplorable state of affairs, however, there is one bright ray of hope. This ray of hope emanates from the New York Botanical Garden, a park so located as to be accessible to the masses for a five-cent fare. This reservation includes about two hundred and fifty acres of land so diversified in character that the flora of rock and hillside, of swamp and meadow, of pond and stream, of open woodland and hemlock gorge are splendidly represented.

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Here, especially on Sundays and holidays, the people flock in multitudes; the Lower East Side comes *en masse* and pours in an almost continuous stream through the entrance at the terminal station of the Third Avenue Elevated Railway. All are welcome to whatever the Botanical Garden offers in the way of education, of beauty, of sunshine and fresh air. But unfortunately where so much is offered, still more is taken, and the protection of the plants, particularly of the flowering shrubs and wild flowers, has become a complicated and difficult matter. If every jack-in-the-pulpit must have his own personal guard in the form of a policeman, it is safe to assume that Jack's congregation will be a limited one.

With the hope of gaining some knowledge that might be of service in the solution of this problem which is far more complex than appears upon the face of it, I undertook the investigation here reported. With a humble heart, an open mind, and a small note-book, I fared forth into the Garden, and went about among the people to collect facts and information. These facts are so many side-lights upon the situation. From my note-book, I have selected such a list as is warranted by the limitations of this paper. One could easily fill a quarto volume with similar items. The selection has been made with a view to present such facts as may be suggestive to the reader by throwing light upon various phases of the question.

1. Twenty roots of Solomon's seal showing from one to fifteen scars were taken from one person by the guard at the exit.

2. Two little girls had their lunch-boxes filled with violets taken up by the roots; they wanted to plant them in a box at home and see if they would grow.

3. Within the limits of one hour, I saw three persons in as many different parties carrying ferns that had been taken up by the roots; they said they were going to put them in pots.

4. Three little girls had a wild-rose bush carefully taken up by the roots and wrapped in paper. They didn't know they couldn't take things that were wild; other people were getting things; and they did so want to take the rose-bush home and set it out in a pot.

5. Three girls, fourteen or fifteen years old, had three huge bunches of jack-in-the-pulpits. There were no roots, but about half were gathered with the two leaves. I asked the girls to count them : one had twenty-nine, one had forty-six and the third had forty-nine, making a total of one hundred and twenty-four. They told me that they grew way over there in the woods ; they didn't know they couldn't pick things over there ; they were very sorry ; they would know better another time.

6. Some boys were having fun with a big dog, "Sport," whom they were exercising by having him swim back and forth across a pond planted with water-lilies and other water-plants. They "didn't know as there was nothin' there."

7. Four girls were gathering wild geranium. I overheard one saying that she was very careful not to take any roots ; a second girl said that she had roots, a whole lot of them. Then followed a discussion.

"What good are roots anyway?" said the girl who had gathered them.

"Why, to make more flowers next year," replied the girl who had no roots.

"Oh no ! the flowers next year come from seeds."

"But if we gather the flowers, there won't be any seeds."

"What difference will that make ! the seeds are in the ground." This was enlightening to me and I entered joyfully into the conversation. "How do the seeds happen to be in the ground?" I asked. The girl shrugged her shoulders : it was a little hard to explain, but they were there like the stones and the dirt. "Did they grow?" "Oh no, they belong to that great class of things that just are."

This girl said that she was ten years old, that she attended the public school, and that she lived in the vicinity of 70th Street.

8. A man and wife were gathering dogwood — a great armful. I told them that every effort was being made to keep the wild flowers and plants of all kinds, so that people might come and see what the country is like in springtime or at any other time. At first the man stared uncomprehendingly, but I gave him time, and he slowly worked it out :

"Gosh! if everybody tuk some, thar wouldn't be none!"

9. A small brother and sister were running along the South Walk. Each broke a branch of the yellow-flowering *Kerria* and then ran on. They came to a fine shrub of bridal-wreath, dropped the *Kerria* and took a branch of bridal-wreath; this they almost immediately exchanged for branches of the Judas-tree. They had dropped the Judas-tree, and were jumping for lilacs when I caught up with them. It was a pretty game, but it was time to interrupt it.

Their mother was lugging a heavy baby, and the father with pipe in mouth and hands in pockets was leading the happy procession. "Your children are in mischief," I said to them breathlessly, "You must not let them break the branches."

"H-u-u-h?" drawled the father: "I told 'em they hadn't orter, but I cayn't stop 'em," said the mother.

"Can't *you* stop them?" said I to the father.

"H-u-u-h?"

"Can't you stop your children?"

"Shtop 'em?"

"Yes, stop them from breaking the shrubs — the branches."

He gazed about with a vacant stare. "Wha' for?" he finally said. I gave it up and "shtopped" the children myself.

10. A certain space had been temporarily railed off in order to keep people from treading down the undergrowth and from making trodden paths through that portion of the woods where the dogwood grows luxuriantly. Within this space, several grown people were breaking the dogwood in a manner shameful to behold. They assured me with indignation that this railed-off area did not belong to the Garden; I could see the fence for myself; of course they couldn't get dogwood in the Garden, but here it was different, it was all right!

11. I said to a well-dressed woman of the better class (?), "I am afraid that you will have trouble in taking that bunch of flowers out of the park." "Oh, no," she said, "I know how to do it." And she placed the flowers inside her folded coat, and hung her coat over her arm, and assumed an air of nonchalance, and walked out of the Garden.

12. An old lady was discovered by a guard in the act of despoiling the garlic-bed. She was interrupted in her labor of love and was escorted to the gates. That night, however, she returned after eight o'clock and succeeded in carrying off the coveted treasure.

13. Two boys were gathering violets, carefully tying them in bunches and placing the bunches in a little pile under a protecting shrub. I seated myself on a rock near by and appeared absorbed in my book. After a while the boys placed the bunches of violets in their hats, put their hats on their heads, held their heads high, marched out of the exit on the Southern Boulevard before the eyes of the guards, and sold the violets to the passers-by for five cents a bunch.

14. The park authorities permit the gathering of dandelions for table-use. Many avail themselves of this privilege as a means of income. One day recently, a guard noticed a suspicious purple color protruding from a huge sack of dandelion-greens (?). The guard requested the Italian to empty his sack; it was full of lilacs; the man was going down town to sell them.

15. A father, mother and little girl were sitting on a bench near the river. Each had a large bunch of wild columbine. The man explained: "We got them over near the barn." "Nobody ever goes there, so they'd never be seen anyway." "A half-dozen children were coming from there with their hands full or we would never have found the place ourselves." "Well, if we don't get them, somebody else will." "We always come every year and get flowers, and we carry them home, too." "We know how to get out of this place without running up against a policeman." And these, too, were apparently people of the "better class" (?).

16. At a distance I saw a two-year-old child borne in the arms of her fond parent. Her little hand was over his shoulder, and it was clasping a bunch of big white trilliums. I hurried to the trillium-bed; the fine clump of *Trillium grandiflorum* was marked only by bleeding stems an inch in height. This was a planted bed and contained several groups of trilliums of different species and each group had its own label.

17. One of the park-policemen thus related his troubles "This afthernoon there wuz a mither here with all her owr childern, and all thim belongin' to all her neighbors. She cud do nothin' at all with ony of thim. I shpoke to thim siveral toims but they paid no attintion at all, at all. Finally I got mahd. I sez to the mither, sez I, 'If yez don't take ony better care of yer childern,' sez I, 'I'll tiliphone for the patrol-wagon, and I'll sind thim iv'ry wan to the stachen-house.' Thin I rounded up thim childern, and I sez to thim, sez I, 'Yez act as if yer wuz niver a comin' here ony more. Yez act as if yer wanted ter carry off iv'rything there is, and ter disthroy all there is lift.'"

18. One hundred and fifty boys in charge of three young men (teachers) were raising a frightful hubbub and leaving death and devastation in their wake. Some had great bunches of jack-in-the-pulpits pulled up by the roots, plants that must have been ten and fifteen years old; some had their lunch-boxes filled with flowers; and worst of all, one bunch of them had suspiciously fat blouses which proved to be stuffed out with birch-bark, in some cases peeled to the cambium and girdling the part of the tree from which it had been taken. The little scamps had climbed the trees for fresh fields above the reach of all marauders except those of their own kind. One of the young men said that he knew that they ought not to do it, he had tried to stop them but they were too many for him.

19. A party of one hundred and five children from the Lower East Side was in charge of a man with a cigarette in his mouth, and a woman whom I was not so fortunate as to see. The children told me proudly that she was a "school-teacher." These children gathered around the bench where I was sitting and volunteered a deal of information. At the time nearly every one was wearing a little bunch of viburnum blossoms. They said that earlier in the day they had gathered such lovely big bunches of flowers; they didn't know the names of them, but they were — oh so pretty! pink and purple and yellow and white; almost every one had had a great lot; and a man had taken them all away from them; and he had told them that they couldn't take

any flowers out of the park ; so now they were just picking what they wanted to wear and to play with.

20. Two children with big bunches of buttercups, wild geranium and jack-in-the pulpits were following their parents. "Why do you let your children gather the flowers?" said I. "Why, they're wild!" was the answer.

21. Three girls of fourteen to sixteen years had seen the notice, had read it, had understood it. Still each had a handful of flowers of various kinds. "Everybody else does it," they said.

22. Two girls about fourteen years old broke a branch from a barberry bush in the Herbaceous Grounds. A guard approached and took it away from them. "I didn't see any sign, did you?" one of the girls said indignantly to the other. "No," was the reply as she turned to give the bush another look, "and what is more, there ain't any." The botanical label is evidently developing a new function ; to the ignorant, its Latin tongue may be full of mysterious and hidden meaning.

23. Three young women, presumably shop-girls, with armfuls of maple, oak and birch branches, and spring-beauties, violets and wild geranium were strolling among the beds in the Herbaceous Grounds. They told me that they hadn't taken a thing from the beds ; that I could see for myself ; that they had gotten their things in the woods on the hill and they were not like those in the beds ; why, they never thought the big signs meant those kind of things, they supposed they meant the things that had been set out in beds or any shrub or plant that had a little sign (botanical label) on it.

24. Two well-dressed women were coming out of the woods with bunches of wild pinks in their hands, I asked them if they had read the notices.

"What notices?"

"Those at the entrances or at various places in the Garden."

"Why, no! why do you ask?"

"Because we are trying to preserve the wild flowers in this park, and it is expressly stated that no one is to pick them."

By this time, a man evidently the husband of one of the two

women, came up as a sort of reinforcement. "Did you read the notice at the gate?" his wife demanded,

"Read the notice! Of course not! Why should I?"

"Do you never read notices?" I gasped.

"Not if I can help it," said the man; "I'm sure I don't," said one of the women; "I never thought of such a thing," said the other.

And then we all laughed and sat down on some rocks to talk the matter over. "Now," said the man, "we represent the average people. I suppose I have been here a dozen times, but I have never taken the trouble to read one of those notices."

From their good English and their good clothes and above all their good nature, I am sure they were considerably above the "average people." "Well," I said, "why haven't you read them?"

"Too long," said the man.

"Yes," said the woman, "they are too long; they are a regular half-column-in-the-newspaper notice. I can't imagine myself stopping to read any such thing when there is so much that is beautiful to look at. But truly I never would have dreamed of touching a flower if I had known that it was against the rules of the park. Now if you want to keep your wild flowers, why don't you put up a lot of short notices all over the grounds, just a few words that one cannot help reading. Then people like us and children would understand."

25. Two girls had thirty-six jack-in-the-pulpits. They had collected them for their drawing-teacher; she wanted to use them for the lesson the next day.

26. A mother with a baby in her arms was followed by two small girls. The children had their hands full of buttercups. One of the guards approached and took away the flowers; "We wanted to bring them to the teacher," wailed the little girls.

27. A little boy of nine years was laboring hard in his endeavor to break a branch of dogwood. "Oh, little boy," I cried "you mustn't break any branches."

"It is for my teacher," said the little boy proudly.

"But," said I impressively, "it is expressly prohibited."

"But it is for my teacher!"

"And you will be under the penalty of the law," I continued solemnly, "by order of the Board of Managers."

"I tell you I am breaking this branch for my teacher." And the sturdy little fellow went on breaking.

From the above notes, the following deductions may be made:

The damage done to the Garden is serious; some of it is irreparable, for instance, there is to-day no trace of the trailing arbutus, hepatica and laurel that once grew in the Hemlock Grove.

Two classes of lawless persons are guilty of this damage — the wilfully lawless and the ignorantly lawless. As far as I am able to judge from so incomplete an investigation, the wilfully lawless are in the great minority, including from five to ten per cent. of the cases.

All sorts and conditions, all ages and nationalities of men, women and children must be dealt with.

The most able and intelligent policemen that the city can command are needed to enforce the law for the wilfully lawless. The best of good judgment is often required to distinguish between the wilfully lawless and the ignorantly lawless.

A fence surrounding the entire Garden is an imperative necessity; the authorities already have this work well under way.

It would be of great advantage to fence certain of the most valuable and easily injured portions of the Garden. Constant trampling over the roots of trees, particularly of the hemlocks, is seriously detrimental to the longevity of the trees, and picnicking among the wild flowers is fatal to the flowers. Few flowers are capable of being sat on or slept upon with impunity. There is ample space in the Garden for the picnicker aside from these precious areas. The Hemlock Grove is said to be the pride of New York City, but it will be only another example of pride before destruction unless more strenuous measures are taken to protect this stand of magnificent Canadian hemlock-spruce. To the good results of the fencing system, the dense undergrowth and thrifty ferns and flourishing wild flowers of the Zoölogical Garden bear witness. Even in some of the animal

pens, there is quite a floral development. I noted a small goose-pen — occupied by an African goose — where ten species of wild flowers were in bloom with promise of a succession during the summer; no childish hands could reach them.

No person — parent, teacher, or would-be philanthropist — has any right to bring to the Botanical Garden more children than he can control. Like weeds in a new soil, city children in country surroundings are liable to escape from cultivation and run wild.

The ignorantly lawless include children, foreigners who cannot read English, and the lazy or indifferent who fail to read the posted notices.

Simpler and more frequent notices would vastly reduce the destructive work of the ignorantly lawless. After my conversation with the woman who never reads a notice if she can help it, I proceeded to the main entrance to note the effect of the present notice upon the passing crowd.

The notice reads as follows:

NEW YORK BOTANICAL GARDEN

Leaving paper, garbage or rubbish of any kind, or breaking, picking or carrying branches, plants or flowers, either

WILD OR CULTIVATED

within these grounds are expressly

PROHIBITED

Under penalty of the law.
By order of the Board of Managers.

It measures thirty by thirty-six inches; the letters are yellow upon a dark green ground. It impressed me as a comprehensive, dignified and artistic notice, mimicking its environment of yellow-flowered *Kerria* in a natural and unobtrusive manner. I watched to see how it impressed the crowd; for ten minutes it did not impress the crowd at all. Then a little old lady stepped out from the ranks, put on her spectacles, and began to study the notice.

This attracted general attention and soon a mob was elbowing and pushing about the little old lady and the notice to see what it was all about. The mob lasted until a break in the procession broke it up. Similar crowds gathered at two other times during the next half hour; one of these I drew myself — by imitating the example of the little old lady. Aside from these contagious and congested moments, the notice received little or no attention. From the puzzled look upon the faces of children, it occurred to me that they were not able to read it intelligently.

In order to determine the ability of children under twelve years of age to read and understand it, one of the regular notices of the Botanical Garden was sent to the Horace Mann School of Teachers College, Columbia University. The children of this school come from homes of culture and comfort; they are accustomed to good English; they speak and read well and understandingly. This was in no way designed to be a test of the children; it was a test of the notice. The children looked upon the work as a kind of nice puzzle and did their best. We did the work during the regular nature-study periods of May 20 and 21, one week before the close of the school year.

The notice was taken into the eleven rooms of the first five grades of the elementary school. It was not discussed at all in any room, but it was placed where all the children could see it, and they were asked to study it quietly for a certain length of time varying from five to two minutes. Then it was turned face to the wall and each child wrote what the notice meant to him. In the first grade, the children were sent individually into an adjoining room to report to me, for they were not old enough to write their answers; in the other four grades, the answers were written. The report of this investigation is necessarily shortened to meet the requirements of this paper, but an effort has been made to be as just as possible in the selection of ten representative answers from each grade; also the choice has been made with a view to the preservation of the relative proportion of correct or false or absurd notions of each grade.

GRADE I.

1. "Something about New York."
2. "Something about a garden."
3. "New York something Garden. I did not get any more, got so stuck on that word *Bot*."
4. "New York Baseball Garden."
5. "New York Boat Garden. They want us to go and see the big boats."
6. "About our garden, — the Horace Mann Garden."
7. "About going to the garden today to plant our squash seeds." (What they wanted to do.)
8. "About different kinds of flowers, wild and garden."
9. "Keep off the grass."
10. "About two kings." (Brea*king*, pic*king*.)

Forty three children were tested. Not one caught the real meaning of the notice. The oblique lettering of certain lines proved difficult for children of this grade to read.

Then I put up this notice:

Do not pick
a flower or a leaf
in this park.

Instantly there was a burst of sunshine on the little discouraged faces, and the little hands flew in the air. I am satisfied that every child in Grade I. could read and understand these words, for each was tested in an adjoining room; only five stumbled on a single word — either "leaf" or "park."

GRADE II.

1. "I do not know what you mean."
2. "I do not know what it is at all."
3. "New York Garden. There was a big board. I do not no."
4. "It means you must obay the Policman."
5. "Caring paper is not aloud."
6. "That they can have picking out of door in the park and they cant throa paper around."
7. "It tells about how to pick flowers and how to carry them and telling about the flowers you should not pick."
8. "If any person pick flowers or plants will be punished and may not go in the garden again."
9. "You must not be untidy or pick flowers, of any sort. You may look at them but must not tuch them, wild or not."
10. "Do not put anney papers or anney spoiled things. Do not pick anney flowers of anney kind. Do not pick anney weeds."

Forty-six children were tested. Thirteen understood that no flowers are to be picked; 33 did not understand. Many of the papers were nearly blank. Time required for reading the notice was five minutes. Then I posted

Do not pick
a flower or a leaf
in this park.

I gave the children thirty seconds to read this notice, then turned it face to the wall and asked the children to write what it said. All did the work perfectly or satisfactorily.

I asked the room to read in unison the Garden notice while I pointed to the words. This they did with great effect until they struck the word "*Prohibited*"; one room of 23 children had caught the meaning of the notice, and with one voice shouted "forbidden." The second room failed to respond, but one or two timid voices suggested "not allowed." No one of the 46 could read the word.

GRADE III.

1. "I could not read the words because they were to hard for me."
2. "Bothering the plants is against the law."
3. "Not to kill the plants and not to steal them."
4. "That we should not pick the flowers and through them away."
5. "It means not to throw papers all over or to pick wildflowers or tame ones ether."
6. "It means dont pick flowers, branches or wildflowers. Because it is the law. Do not put rags on the garden."
7. "I think that putting rubbish on the ground would destroy the soil, and picking flowers by people that did not know how to pick them would destroy them and the department wants them kept nicely."
8. "Anyone is not aloud to put any old trash at anywhere in the garden. It is against the law."
9. "It means that nobody can take any rubbigh or brak of any branches because they want to make paper out of it. They will not alow you to."
10. "It means that you are to bring your plant in on Monday morning and put it in the exhibition."

Fifty-two children were tested. Thirty-three had more or less of the idea that no flowers are to be picked; 19 showed no conception of that idea.

Grade III. was more impressed with the flowers than with the rubbish (see note on Grade IV.).

After finishing the above work, I wrote the word "prohibited" on the blackboard and asked the children to write its meaning. Thirty-five children stated they "did not know"; 17 gave the following or similar definitions:

not aloud
not alowed
not allowed
not allowered
forbided
forbiden
stoped
unlawful
no to do something
not to do a thing
to do a thing right
not to pick a thing
not to peak
means that you were told not to do a thing
do not do so and so.

GRADE IV.

1. "It means not to pick up any branches or sticks or rubbish or garbage, that you find in the park."

2. "If you threw any paper or rubbish around the animils will get it and get sick."

3. "I think it means that if you throw rubbish in the street or pick flowers you will be scolded."

4. "A man that picks flowers in the Potanical Gardens is disonest because it is the pentely of the law."

5. "It means that if you leave paper or pick flowers you will have to go to the stachen house."

6. "If anybody picking flowers will be strickly forbiden to chase any squirrel. If anybody throwing paper on the ground will be punished."

7. "It means not to put rubbish on the garden because it spoils the flowers and not to pick them because they want to keep the flowers for next year."

8. "We should not pick or take any flowers. We should be flower champions. And we should not throw any rubbish on the paths. It is against the law."

9. "I think this notice means that nobody should leave paper or any kind of rubbish in the grounds of this school. The children must not break the branches and flowers or cary anything out of the school-grounds."

10. "This scine means that nobody should through any rubbish in the garden or distroy anything. Nor carry paper around or to pick anything in it. It means that nobody should make it look bad. And the law says so."

Fifty-two children were tested. Only 9 made any point in regard to wild flowers. The time required for reading the notice in this grade was between three and four minutes.

Grade IV. was more impressed with the rubbish than with the flowers (see note on Grade III.).

Thirty-five per cent. knew the meaning of the word "prohibited."

In one room where there were 29 children, I wrote the word "penalty" on the blackboard and asked them to write the meaning. Twenty-one children "did not know"; 8 gave the following:

something bad
something will happen to you
punished severily
to be locked up
get arrested and sent to prisson
pay money
people will get after you and have you fined
something will be done to you if you do not do what is asked of you.

GRADE V.

1. "It means that they have gardens. I can't make anything out of it."

2. "People are forbidden to pick any kind of rubbish, branches or wild-flowers in the park."

3. "This thing means not to liter the park with rubish or paper and not to pick flowers in the park wild or cultivated."

4. "Throwing rubbish or trash on the ground. Picking and breaking flowers and branches is prohibited. Under penalty of the law. By order of the Board of Managers."

5. "It means that no one can break branches from the trees or pick cultivated or uncultivated flowers and not to leave rubbish and paper but to keep the park clean and to keep it pretty."

6. "Paper spoils the grass. Garbish stops up the ground and makes a smell. Some of the trees are rare. Taking branches from the tree makes its branches less and so the tree gets thinner. If you pick one flower, it makes one flower less."

7. "It means that if you were to throw papers or garbage around it would injure the appearance and the flowers are not only for you but for the public. The wild-flowers are the same and it would spoil their natural appearance."

8. "The Botanical Garden of New York has had the trees and flowers ruined by people picking them, so as the flowers will be allowed to remain they have forbidden any person to pick any kinds of flowers within the bounds of the garden."

9. "You should not pick flowers or any kind of bush in the park. Do not leave papers or any kind of rubbish on the ground. If you do expect to be spoken to by one of the managers because they are supposed to keep the park in good order."

10. "It is not at all good for people to throw rubbish around the streets or any private grounds as they, the other people, might get that dreadful illness of tuberculosis."

Seventy children were tested. The time required to read the notice was three minutes; in one of the three rooms, the children were limited to two minutes, but their answers were shorter, more confused and in every way less satisfactory than in the other two rooms. Answers 1 and 2 are samples of the result of the two-minute reading.

Sixty per cent. could define "prohibited"; only thirty per cent. could define "penalty." These words do not belong to the vocabulary of the child although he is familiar with "forbidden" and "punishment" long before he comes to school.

An inspection of the above report shows that the notice is not effective for children under twelve years of age for the following reasons:

1. It is too long; few children can read it in less than three minutes.

2. The oblique lettering is puzzling; children are not accustomed to it.

3. The form of expression is too complex; the child loses the connection and so fails to grasp the meaning.

4. The force of the notice centers upon the word "prohibited"; the great majority of children do not know the meaning of the word.

5. The "protective" coloring not only fails to command attention; it is more difficult to read than black and white.

6. Owing to the finish which reflects light, there was difficulty in placing the board so that all could read at the same time; in every room it was necessary to change the position of some of the children.

If then this notice is not generally intelligible to children in the school-room when it is presented for study as a school-exercise, what can be expected of children who are out in holiday spirit and distracted by a thousand sights and sounds?

What is true of the ability of the child under twelve years of age to read and understand English, is also true of the majority of foreigners who come to the Garden. Many a parent, indeed, is wholly dependent upon his child to read and to interpret for him.

Many groups of children may be seen in the Garden accompanied by no older person. I found one child of eight years in charge of four younger children! Now by far the greater part of the wild flower destruction is the work of children who are neither naughty nor wilful; they are simply ignorant of the fact that they should not pick the wild flowers in the park, and they pick them because it is a natural inherent thing for the child to pick flowers, and because "everybody else does." It is unjust to blame these children; in justice to the child, the notice should be intelligible to him. It need be neither large nor prominent, but it should be so simple that he who runs may read, and so frequent that one could not escape seeing it. The number might well vary with the season, culminating at the time of the blossoming of the spring flowers and reaching the maximum in those places where they bloom in most tempting profusion.

Finally there is the teacher. While it is true that more than once I learned of some teacher and her flock who picked flowers unreservedly until stopped by the guards, and although there exists the special teacher who, more than any other, is tempted to lose the perspective and proportion of things in pushing her own particular interest, still I hold that the future of the wild flowers lies largely in the hands of the teacher. The lawless or ignorant or indifferent teacher is not the rule in New York or any other place.

The teacher supplements the teaching and training of the home. Let college presidents say what they will, it would be a sorry day if some morning the nation should awaken and find all the teachers married. Julia Ward Howe, full of years and wisdom, said of

her little grandson, "He did not believe me but when his teacher —a mere slip of a girl —said it was so, he never dreamed of doubting." In the heart of the little boy who was breaking the dogwood, his teacher was above the law and beyond the Board of Managers.

And since this is so, my fellow-teacher, a great responsibility rests upon us. It is for us to instruct the child in those municipal laws which concern him; it is for us to teach him to respect authority and to regard public property. But if we do this only, we but do the work of the hireling. It is for us to implant in the growing soul of the child such a love of nature and the beautiful that he will have no desire other than to help to make the parks places of beauty and loveliness. It is for us to develop in the child-soul so true and loyal a love for the wild flowers that he will enjoy them most when he sees them in their own setting and surroundings. We must study to work out ways and means to make this a living and vital subject to the child; by demonstration and experiment we must bring vividly before him the function of root and leaf, of flower and seed; we must make his interest an intelligent interest. When we shall have accomplished this, then the problem of the preservation of the wild flowers of the New York Botanical Garden will be solved.

MARY PERLE ANDERSON,
Teacher of Nature Study in
the Horace Mann School of
Teachers College, Columbia University.

A RARE CYCAD.

One of the most remarkable plants among the Cycadaceae, or cycas family, is the one here illustrated, *Stangeria*, a native of southern Africa. A single plant of this will be found in the cycad house in conservatory range no. 2. This was obtained in an exchange arranged with one of the European botanical gardens in 1902. For some years it was content to make foliage only, but in the summer of 1908 it gave evidence of making a cone. The development of this was watched with much interest, for the

plant is exceedingly rare in this country. This cone proved to be a pistillate one, and it is now almost mature, just about a year from the time of its first appearance. As will be seen from the illustration, the cone is ovoid. The plant is dioecious, that is, it bears the staminate and pistillate cones on different individuals. The staminate cone is said to be longer and narrower, cylindric in shape, measuring as much as six inches long and one and a quarter inches in diameter.

The genus *Stangeria* is especially noteworthy among the cycads in having the leaflets pinnately veined, a character unknown in any other genus of this family, in which the venation is ordinarily parallel. So unusual is this character in the family that Kunze in 1835, when working on the botany of southern Africa, referred a leaf specimen of this plant to the fern genus *Lomaria*, never suspecting its true relationship, believing it to be the *Lomaria coriacea* Schrad. Four years later, recognizing this reference as erroneous, he gave it the name of *Lomaria eriopus*, still believing it to be a fern. In 1853 Thomas Moore seemed to have an inkling of the truth, for he refers to it as a "fern-like *Zamia* or a *Zamia*-like fern." He has no doubt as to its being a new genus, however, for he gives it the name of *Stangeria paradoxa*, in honor of Dr. Stanger, who first introduced living specimens into Europe, sending them from Natal to the Botanic Garden at Chelsea in 1851. Three years later specimens of the cones were exhibited before the Linnæan Society, thus determining its true relationship.

An examination of the foliage of the plant in the Garden collection will show how strong is this resemblance of the leaves to those of a fern, and it is not to be wondered at that, in the absence of cones, it should have been considered a fern. Although this relationship proved to be erroneous, the specific name which was first applied to it must be adopted, and the old *Lomaria eriopus* Kunze must be known now as *Stangeria eriopus* (Kunze), the later specific name of "paradoxa" becoming a synonym. A staminate plant of this curious cycad is a great desideratum, and it is to be hoped that some time the Garden may be fortunate enough to secure one.

GEORGE V. NASH.

Stangeria eriopus.

NOTES, NEWS AND COMMENT.

An interesting series of argols from southern France and southern Africa has lately been presented to the Economic Museum by Dr. H. H. Rusby. Argol, or crude tartar, is the crust deposited from grape juice during fermentation, and upon purification yields cream of tartar.

Dr. Joseph E. Kirkwood, formerly a student at Columbia University and the New York Botanical Garden and later professor of botany in Syracuse University, has been appointed assistant professor of forestry and botany in the University of Montana at Missoula, Mont. Dr. Kirkwood spent the year 1907–'08 in Mexico as a botanical investigator for the Continental-Mexican Rubber Company.

Mr. William T. Horne, who was fellow in botany in Columbia University and a student at the Garden in 1903–'04, has resigned his position as plant pathologist of the Cuban Agricultural Experiment Station to become assistant professor of plant pathology in the University of California.

Volume 17, part 1, of "North American Flora" appeared June 30, 1909. It contains description of the Typhaceae by Percy Wilson; Sparganiaceae, Elodeaceae and Hydrocharitaceae by P. A. Rydberg; Zannichelliaceae, Zosteraceae, Cymodoceaceae, Naiadaceae and Lilaeaceae by Norman Taylor; Scheuchzeriaceae by N. L. Britton; Alismaceae by J. K. Small and Butomaceae and Poaceae (pars) by G. V. Nash.

Mr. Percy Wilson, Administrative Assistant, returned from the Bahamas June 13, after a successful survey of the islands of the Salt Key Bank. A report of this expedition will appear in a forthcoming issue of the JOURNAL.

Mr. William R. Maxon, Assistant Curator, U. S. National Museum, Washington, D. C., spent the last two weeks of June at the Garden, completing manuscript for a part of "North American Flora."

Mr. W. W. Eggleston has recently returned to New York from a four weeks' collecting trip in the Cumberland-Tennessee River region of western Kentucky.

Dr. Daniel S. Martin, of the Charleston Museum, visited the Garden during June. Dr. Martin was instrumental in securing much-needed specimens of Devonian fossil plants for the paleobotanical collection, in exchange for similar specimens from various Cretaceous horizons.

In the large bed in the court of the conservatories, in front of the main entrance, a large collection of American desert plants has again been installed. Of especial interest in this collection at the present time are two plants of the genus *Agave*, which have sent up their tall flowering stems and are about coming into bloom; one of these "century plants" has a long narrow cluster of flowers, in the other it is branched. There are many species of the cactus, lily, amaryllis and other families which form a large part of the flora of the American desert, and the peculiar adaptation of these to various conditions is always a matter of great interest. In addition to this bed, which has been devoted to plants of the American desert for the past two years, this year there have been established two other beds, one on either side of the paths bounding the center bed. These are also devoted to desert plants, but the collections placed therein are from other than American countries. The one to the east is composed entirely of desert plants from southern Africa Here are represented the fig-marigolds of the genus *Mesembryanthemum*, which bear a profusion of rich-colored flowers, members of the Aizoaceae, or carpet-weed family; the genera *Aloe*, *Gasteria* and *Haworthia*, all members of the Liliaceae, the lily family; and the genus *Euphorbia*, of the Euphorbiaceae, or spurge family. It is curious to note the resemblance in form between the euphorbias from that region and some of the columnar *Cerei* across the path, which are all natives of America. The bed to the west is given over entirely to the Crassulaceae, or orpine family, found not only in the desert regions of this country, but also in those of the Old World. Among the American genera here are *Echeveria*, *Stylophorum* and *Pachyphytum;* while the Old World is represented by such genera as *Crassula* and *Sempervivum*. The large genus *Sedum* is cosmopolitan, and a number of its species form part of the collection.

The collection of desert plants at the propagating houses has been moved out of doors into the adjoining nursery for the summer, occupying a portion of the enclosure just to the south of the range of houses. They are grouped in long narrow beds, divided by paths, so that the collections may be readily studied. Collections of this kind are usually much benefited by this out-of-door treatment.

Meteorology for June. — The total precipitation recorded at the Garden for June was 2.95 inches. The heaviest rainfall of the month was on June 28 about 3:00 P. M. when .95 inch was recorded within an hour. The high wind which prevailed may have interfered with the record so that the rainfall at this time may have been more than the record shows.

Maximum temperatures were recorded of 84° on the 3d, 85.5° on the 12th, 87° on the 14th, and 98° on the 25th. Also minimum temperatures were recorded of 54° on the 2d, 51.5° on the 10th, 47° on the 19th, and 66° on the 22d, and 28th. Mean temperature for the month was 72.5°.

ACCESSIONS.

LIBRARY ACCESSIONS FROM APRIL 1 TO JUNE 30, 1909.

ANDREWS, JAMES. The Parterre: or, beauties of flora. London, 1842.

CLINTON-BAKER, H. Illustrations of conifers. Vol. 1. Hertford, 1909.

CONWENTZ, HUGO WILHELM. The care of natural monuments with special reference to Great Britain and Germany. Cambridge, 1909. (Given by Dr. N. L. Britton.)

DINTER, KURT. Deutsch-Südwest-Afrika. Leipzig, 1909.

EATON, DANIEL CADY. Ferns of North America. Salem and Boston, 1879–'80. 2 vols. (Given by Miss E. Collins.)

FRANCÉ, RAOUL HEINRICH. Pflanzenpsychologie als Arbeitshypothese der Pflanzenphysiologie. Stuttgart, 1909.

GEINITZ, HANNS BRUNO. Charakteristik der Schichten und Petrefacten des sächsisch-böhmischen Kreidegebirges, sowie der Versteinerungen von Kieslingswalda. Neue Ausgabe. Leipzig, 1850.

GOETHE, RUDOLPH & IHNE, EGON. Deutscher Obstbau. Berlin, 1909.

GREEN, JOSEPH REYNOLDS. An introduction to vegetable physiology. Ed. 2. Philadelphia, 1907.

KNOWLTON, FRANK HALL & RIDGWAY, ROBERT. Birds of the world. New York, 1909. (Given by Dr. N. L. Britton.)

LEVY, ERNST. Blumen- und Teppichbeete. Ed. 8. Ed. by J. Berthold. Leipzig, 1909.

Memoirs of the Board of Agriculture of the State of New York. Vols. 1–3. Albany, 1821–'26. (Given by the Trustees of Columbia University.)

NEHRLING, HENRY. Die Amaryllis oder Rittersterne (Hippeastrum). Berlin, 1909.

PITTIER DE FABREGA, HENRI FRANÇOIS. Ensayo sobre las plantas usuales de Costa Rica. Washington, 1908. (Given by the Trustees of Columbia University.)

PRANTL, KARL ANTON EUGEN. Lehrbuch der Botanik. Ed. 13. Ed. by Ferdinand Pax. Leipzig, 1909.

RAMALEY, FRANCIS. Wild flowers and trees of Colorado. Boulder, 1909.

THEOBALD, FREDERICK V. The insect and other allied pests of orchard, bush and hothouse fruits and their prevention and treatment. Wye, 1909.

TORREND, CAMILLE. Flore des myxomycetes. S. Fiel, 1909.

WARMING, JOHANNES EUGENIUS BÜLOW & VAHL, MARTIN. Oecology of plants. Oxford, 1909.

WESTERMANN, D. Die Nutzpflanzen unserer Kolonien und ihre wirtschaftliche Bedeutung für das Mutterland. Berlin, 1909.

MUSEUMS AND HERBARIUM.

32 specimens of *Crataegus* from eastern Pennsylvania. (Given by Dr. C. D. Fretz.)

11 specimens of herbaceous and woody plants from South Carolina. (Given by Prof. W. C. Coker.)

15 water color pictures of tropical plants. (Given by Mrs. D. E. Oak.)

3 specimens from South Carolina for the systematic museum. (Given by Dr. H. H. Rusby.)

3 specimens of gill-net floats made from the roots of *Taxodium distichum*, from Boot Key, Florida. (Given by Dr. N. L. Britton.)

5 specimens of argols from Europe and Africa. (Given by Dr. H. H. Rusby.)

2,598 specimens of mosses from California. (Collected by Dr. M. A. Howe.)

50 specimens "I Funghi Parassiti," fascicles 16 and 17. (Distributed by Professors G. Briosi and F. Cavara.)

14 specimens for the drug collection. (Given by Dr. H. H. Rusby.)

2 cones of *Zamia integrifolia* from Jamaica, West Indies. (By exchange with the Department of Agriculture, Jamaica, W. I.)

2 specimens of fungi from British Columbia. (Given by Miss Winifred J. Robinson.)

12 specimens of fungi from New York and New Jersey. (Given by Mr. W. H. Ballou.)

25 specimens of fungi from New York. (Collected by Dr. W. A. Murrill.)

26 specimens of miscellaneous parasitic fungi from Ohio. (Given by Prof. A. D. Selby.)

27 specimens of miscellaneous fungi from Vermont. (Given by Dr. Gertrude G. Burlingham.)

10 specimens of *Colletotrichum cereale* from Ohio. (Given by Prof. A. D. Selby.)

ACCESSIONS: PLANTS AND SEEDS, JUNE, 1909.

2 plants for herbaceous grounds. (Given by Mr. F. Wenisch.)

15 plants for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

4 plants of cacti for conservatories. (By exchange with Mr. F. Weinberg.)

4 plants of *Cyperus Papyrus* for conservatories. (In exchange with Messrs. Siebrecht and Sons.)

2 plants of *Dryopteris Clintoniana* × *marginalis*, for nursery. (Given by Mr. R. C. Benedict.)

2 plants of *Monstera deliciosa* for conservatories. (Given by Mrs. Louis Fitzgerald.)

10 plants for woody nursery. (By exchange with Bureau of Plant Industry, U. S. Dept. of Agriculture.)

1,366 plants derived from seed from various sources.

18 plants from the Bahamas, W. I., for conservatories. (Collected by Mr. P. Wilson.)

1 packet of seed. (Given by Mr. S. Praisner.)

2 seeds of *Hyphaene thebaica*. (By exchange with Bureau of Plant Industry, U. S. Dept. of Agriculture.)

33 packets of seed. (By exchange with Hortus Tenggerensis, Lawang, Java.)

2 packets of spores of *Dryopteris*, from Bermuda, for conservatories. (Given by Mrs. Bluck, via Miss Delia W. Marble.)

140 packets of seeds. (By exchange with Botanical Garden, Oxford, England.)

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North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies and Central America. Planned to be completed in thirty volumes. Roy. 8vo. Each volume to consist of four or more parts. Subscription price $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Vol. 22, part 1, issued May 22, 1905. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae.

Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

Vol. 25, part 1, issued August 24, 1907. Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908, contains descriptions of the family Grossulariaceae by F. V. Coville and N. L. Britton, the Platanaceae by H. A. Gleason, the Crossosomataceae by J. K. Small, the Connaraceae by N. L. Britton, the Calycanthaceae by C. L. Pollard, and the Rosaceae (pars) by P. A. Rydberg.

Vol. 22, part 4, issued Nov. 20, 1908. Rosaceae (pars) by P. A. Rydberg.

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Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by Dr. Arthur Hollick and Dr. Edward Charles Jeffrey. viii + 138 pp., with 29 plates. 1909

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. Four volumes.

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121. Reproduction by Budding in Drosera, by Winifred J. Robinson.

122. Notes on North American Hypocreales—II. Nectria Peziza, by Fred J. Seaver.

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EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

OF

The New York Botanical Garden

VOL. X August, 1909. No. 116.

THE BOTANICAL GARDEN IN THE HUDSON–FULTON CELEBRATION.

In coöperation with the Hudson-Fulton Celebration Commission, specimens of all the native trees of the Hudson River Valley growing in the grounds of the New York Botanical Garden will be marked temporarily with a large letter "H." Inasmuch as nearly all the wild trees of the valley are growing within the grounds, either wild there, or planted in the arboretum and along the driveways, this illustration of the trees which might have been seen by Hudson and his company in 1609 will be nearly complete. While the number of individuals of most kinds in the Hudson Valley has been greatly reduced by clearing land for cultivation and by lumbering operations, it is not likely that any species native to the valley has been exterminated within its bounds.

Another feature will be a Guide Book to the grounds, buildings and collections of the Garden to which will be appended a descriptive list of the native trees of the Hudson River Valley written by Mr. Norman Taylor, an assistant curator; this list will give a short popular account of each of the kinds of trees and a number of them will be illustrated by reproductions of photographs. This document will be issued as a Bulletin of the Garden and distributed to all members and to all institutions with which the Garden has exchange arrangements.

The question has been asked if any of the large trees of the Hudson River Valley were in existence in 1609. The most likely illustrations of this are the large white oaks (*Quercus alba*)

which are found in many places, some of them approximating four feet in trunk diameter, or perhaps even larger. The slow growth of this tree after its first hundred years of life would make it probable that some of these monsters were at least saplings before the end of the sixteenth century. The average increase in diameter of the white oak as calculated from the thickness of annual wood rings of trees cut on Staten Island some years ago, is 0.18 inches up to the age of 47 years. Subsequently, the layer of wood annually laid on is much thinner. Observations on the largest white oak within the grounds of the Garden, growing in the woods south of the Museum Building along the path leading to the waterfall near a cluster of sweet birches show that its circumference, measured July 30, 1909, at four feet above the ground, is 11 feet and 2 inches; its diameter is therefore about 42½ inches and its radius 21¼ inches; allowing for the thickness of the bark the radius of wood is about 20 inches. A little piece was taken out from the side of this tree with a sharp chisel and the wound made carefully covered with tar. The number of wood layers to the inch as revealed by this experiment is 16, the average thickness of the layers being thus 0.062 inches. From these observations and other data it is estimated that the average thickness of the annual wood layer of the white oak in trunks up to 42½ inches in diameter is approximately 0.09 inches, which would indicate that this individual tree is about 220 years old. It would therefore seem that white oaks with a wood-radius of from 25 to 27 inches would be 300 years old.

A third feature of the coöperation will be an illustrated lecture on the native trees of the Hudson River Valley to be delivered at the Museum Building of the Garden on the afternoon of Saturday, October 30, at four o'clock.

N. L. Britton.

REPORT ON THE BOTANICAL EXPLORATION OF THE ISLANDS OF THE SALT KEY BANK, BAHAMAS.

Dr. N. L. Britton, Director-in-Chief.

Sir: I have the honor to submit herewith a report upon the recent expedition to the islands of the Salt Key Bank.

The main object of this trip was to obtain herbarium specimens and living plants to aid in the comparative study of the flora of this small group of islands of the southwestern part of the Bahamian archipelago with that of northern Cuba.

At your suggestion, I left New York by Ward Line Steamer "Vigilancia," at 4 P. M., May 7, 1909, and arrived at Nassau, New Providence, on the morning of the eleventh.

Here a day and a half was given to outfitting, and I was fortunate in securing the coöperation of Mr. Lewis Brace, who rendered valuable assistance on the expedition sent to the Bahamas in November, 1907.

Taking advantage of a fair wind to sail northward, we left Nassau late in the afternoon of May 12, and the following afternoon anchored under the lea of Riding Rocks, south of the Bemini Islands, during a heavy sea and squally weather.

The herbaceous plants obtained at this point were for the greater part fleshy and are mostly the same as those met with on other West Indian and Florida coasts. The few woody plants, being subject to strong winds, were low and more or less prostrate and afford an excellent shelter to the various sea-birds which collect here during the breeding season.

Sailing at day-break on the morning of the fourteenth, we were again obliged to lay to off Orange Key, seventeen miles to the south, until early in the evening. This is the southernmost islet on this side of the Great Bahama Bank and is of little interest botanically. The sea-purslane (*Sesuvium Portulacastrum*) was the only flowering plant found here, and from all appearances it has recently established itself in three or four places, on the more elevated parts.

Early in the evening of May 14, while preparing for our voyage

southward, the anchor-chain parted and we put to sea, approaching the rocky shores of the Anguilla Isles, during a squall, early the following morning.

The wind falling at about seven o'clock, the strong current carried us seaward, when, with the freshening of the breeze, we finally came to an anchorage about noon.

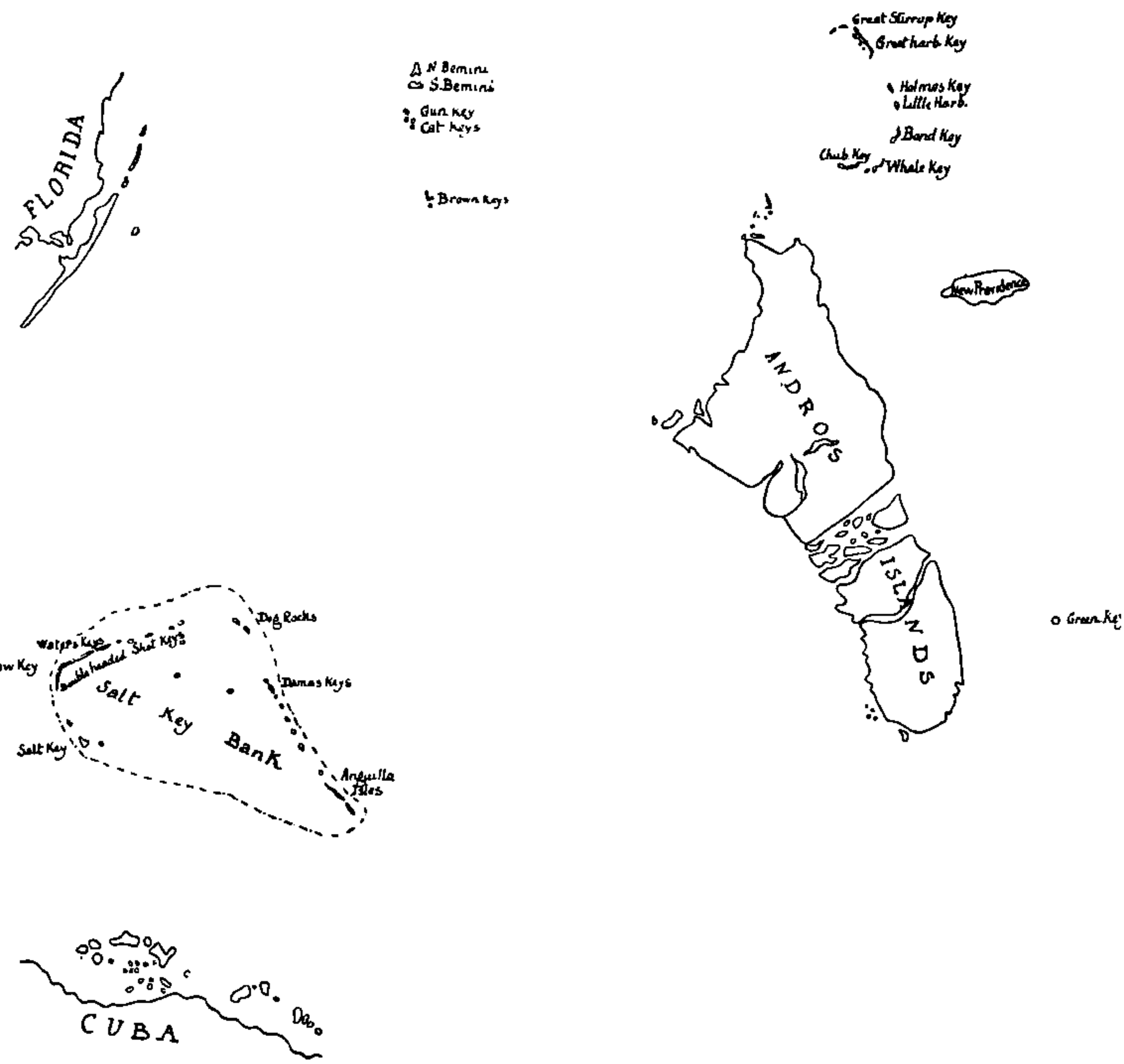

FIG. 29. Showing location of Salt Key Bank.

The Anguilla Isles lie at the southeastern extremity of the Salt Key Bank and are about eight miles in length. They are low, narrow, and for the most part rocky, and are uninhabited except at certain seasons of the year, when they are visited by "turtlers."

The greater part of four days was occupied in the exploration of this interesting group of islands. Stops were made at three

different places along the coast and many plants of interest were collected. In the "white lands" at the northern end, the palmetto (*Sabal Palmetto*) of the southern United States was represented by only about half a dozen individuals, while the silver-leaved thatch-palm (*Coccothrinax argentea*) was more abundant.

At the next stopping point on the coast, about three miles from the south end, the land was very rugged and the flora of little interest. The woody vegetation was low and in places almost impenetrable.

Our work on the Anguillas was concluded by spending May 17 and 18 near the southern end, where the "white lands" (sandy places) were more extensive. The vegetation here was far more luxuriant than at the northern end, and a greater number of species were represented. The two palms previously met with were found in greater abundance, while other species hitherto unknown to grow in the Bahamas were collected.

Plants of the Bromeliaceae and Orchidaceae were apparently lacking in the flora.

In the shallow, sandy bays of this vicinity, special attention was given to the study of marine plants and it is already clear that the collections just made are of high scientific importance. A marine alga of much interest was quite plentiful. This species has hitherto been somewhat doubtfully identified with *Udotea argentea* Zanard—an extremely rare species first described in 1858 from plants collected in the Red Sea at Suez. The American plant has, however, just been described as new by A. and E. S. Gepp of the British Museum in the July number of the *Journal of Botany*, under the name *Udotea verticillosa*. The only representatives of this species hitherto known in the Atlantic Ocean appear to be specimens in the Nicolas Pike herbarium collected at Key West, Florida, in 1864, and a few others obtained by the Challenger Expedition at St. Thomas in the Danish West Indies.

The turtle-grass (*Thalassia testudinum*) was very common in from six to eight feet of water and after careful examination with a "water-glass," a few flowering and fruiting specimens were obtained.

Calm weather and light head winds, accompanied by heavy

rains, delayed our passage across the bank to Salt Key, which was reached on the evening of the twentieth. Salt Key (Cay Sal), so-named from possessing a valuable salt pond, is about thirty miles off the north-central coast of Cuba. The island is triangular in shape, small, and composed almost entirely of sand, The northern side is formed by a narrow ridge of sand hills, the remainder being low. Here also were found the two palms first met with at the north end of the Anguilla Isles.

Upon arriving at Elbow Key, May 22, we were enabled, under the guidance of Mr. James A. Thompson, Head Keeper of the light-house, to examine the greater part of the island. The flora however was of little interest, as less than a dozen species of plants were obtained.

Our expedition to the Salt Key Bank was concluded by a visit to Water Key, a few miles to the north. Owing to the unsettled condition of the weather, and a heavy sea, after a few hours spent ashore, we left for Nassau, where we arrived five days later, after a series of calms, and a squall which carried away our mainsail and drove us seaward for two hours.

From our return until June 8, the time was spent in local exploration about town, where we collected a number of plants new to the flora of the Bahamas. Several trips were made to Hog Island, previously visited, at a different season, by yourself and Dr. C. F. Millspaugh of the Field Museum of Natural History of Chicago.

The remaining two days at Nassau were devoted to the care and packing of the specimens which I brought through safely to New York upon my return on June 13.

Respectfully submitted,

PERCY WILSON,

Administrative Assistant.

SOME AMERICAN BOTANISTS OF FORMER DAYS.[1]

A hundred and twenty years ago, when Richard Pulteney had written his "Historical and biographical sketches of the progress of botany in England," he put into his preface these apt words: "In tracing the progress of human knowledge through its several gradations of improvement, it is scarcely possible for an inquisitive and liberal mind, of congenial taste, not to feel an ardent wish of information relating to those persons by whom such improvements have severally been given: and hence arises that interesting sympathy which almost inseparably connects biography with the history of each respective branch of knowledge." And it is as true as ever that, if one would understand the progress of science, he must study the personality of the men whose labors have resulted in that progress.

Our theme this afternoon, "Some American botanists of former days," is a very limited one. The term "American botanists" is intended in its narrow sense, as referring only to those whose scientific work has been accomplished, at least in part, within the bounds of the United States as they were before our recent period of expansion. And when we say "botanists of former days" we must in fairness omit all reference not only to workers now living but to all who would be living if they had not met with premature death.[2] By the latter limitation we exclude all specialists in plant morphology and physiology, fields of study which have seen their entire development, as far as this country is concerned, within the memory of the living. Even thus limited, the number of botanists worthy of mention on an occasion such as this is so large that we must necessarily omit altogether some who might reasonably be looked for; and we may as well admit that in doubtful instances our choice has been influenced by the facility with which we are able to illustrate[3] our remarks.

The earliest knowledge of North American plants was derived

[1] A lecture delivered in the Museum Building of the New York Botanical Garden, June 26, 1909.

[2] As a matter of fact, no man is mentioned who did not die more than five years ago; and, if all of those mentioned were still living, the youngest would be about seventy years old.

[3] The lecture was illustrated with lantern slides.

from the accounts of observant travelers and explorers, and from specimens and seeds carried to Europe by them and by traders. Living plants and seeds were grown in European gardens, and it was from material raised in this way that most of the early technical descriptions of American plants were drawn. The collectors possessed little or no botanical knowledge, and the scientists who studied the collections can not be classed as "American" in any sense.

The first settler of whose scientific attainments as a botanist we have positive evidence, was John Banister, a missionary in Virginia, who lost his life by falling from some rocks while on one of his collecting expeditions. In 1680, Banister sent a list of Virginian plants to John Ray, of England, who published it as an appendix to his Historia Plantarum in 1688. Fifty years had elapsed, however, before the appearance of a work dealing exclusively with North American plants, and nearly a century before the first botanical work was published in North America.

John Clayton, who came from England to Virginia in 1705, and was for 51 years clerk of Gloucester County, prepared a scholarly work on Virginian plants. Of course he lacked facilities for publication, and for the comparison of his plants with those previously described; his specimens and manuscripts were sent to Holland, where the flora was published under the editorship of Gronovius, whose blunders are to be found on nearly every page. Clayton's botanical exploration covered all of eastern Virginia, and extended through many years; even the year before his death, when he was about 87 years of age, he made a botanical tour through Orange County. All of the carefully prepared manuscripts and collections left by him were destroyed by fire a few years later, during the Revolutionary War.

While Clayton was pursuing his explorations in Virginia, Cadwalader Colden was studying the flora of his great three-thousand-acre estate, "Coldenham," in the colony of New York. Dr. Colden was a very busy man, nearly always holding some public office of importance, and at one time lieutenant-governor of the colony of New York; yet, with the aid, no doubt, of his gifted daughter, he found time to prepare a careful account of the

native plants of Coldenham, and sent this to Linnaeus, who published it in the proceedings of the royal society of Upsala. This was the earliest local flora of any part of the present state of New York. The daughter, Jane Colden, commenced the preparation of a remarkably accurate flora of New York, of which the completed portion is preserved, in manuscript, in the Department of Botany of the British Museum.

Banister, Clayton, and Colden, as well as other early workers on the flora of North America, such as Catesby, Garden, Kalm, Vernon, and Kreig, were all Europeans by birth. The first native American botanist was John Bartram, a Quaker, who was born near Philadelphia in 1699. He published but little, and that little furnishes very slight evidence of his botanical attainments; but he was a correspondent of Collinson, Gronovius, and other famous European botanists of his day, and by the number and accuracy of the observations contained in his letters seems to have deserved their admiration. He traveled throughout eastern North America, from New York to Florida, collecting particularly seeds for his Old-World correspondents; but he is best remembered from the fact that he established, near Philadelphia, about 1730, the first botanic garden in America, and into this garden he gathered representatives of the largest possible number of native American plants. It was a small affair (the entire property comprised only five acres), and a part of the limited space was occupied by the house, built by his own hands; but the garden was a remarkable project indeed for those days, and is known to have contained many choice specimens.

William Bartram, son of John, is perhaps better known as a botanist, because of the fact that his account of his extended travels in the southern Atlantic states was published, and contains many important observations upon the plants of the regions explored by him. He maintained the garden established by his father, and after his death the property remained in the hands of owners who were deeply concerned in its preservation, for many years. During a short period of neglect, serious damage was done to the old garden, but within the past twenty years it has become the property of the city of Philadelphia, and is now a city

park. Its collection of trees and shrubs has always been a notable one, and the old house is still in an excellent state of preservation.

The second American botanic garden in North America was also near Philadelphia, and was established in 1773 by Humphry Marshall, a first cousin of John Bartram and, like him, a Quaker. The old garden has long since passed into a state of decay, but the house, built by Marshall with his own hands in 1773, is still in an excellent state of preservation. Humphry Marshall has the distinction of having written the first botanical work ever published in the United States, an account of our native trees and shrubs, printed at Philadelphia in the latter part of the year 1785.

One of the most remarkable of the early American botanists was Thomas Walter, a native of Hampshire, England, who went to South Carolina when a young man, married there, and settled on the banks of the Santee River. How he became interested in botany, how he was able to carry on his botanical work in such complete isolation from the rest of the scientific world, is quite unaccountable. However accomplished, it is an indisputable fact that he prepared a clear, succinct, and remarkably complete flora of the region about his home, which was published in London by John Fraser in 1788. Fraser was a collector who visited the southern states repeatedly, the first time as early as 1785; he was a personal friend of Walter's, and took the manuscript back with him upon his return from one of his earlier trips. Walter died in the same year in which his flora was published, less than fifty years of age, and was buried in the garden adjoining his home, where he is said to have cultivated many of the plants described in his Flora Caroliniana. His herbarium is preserved in the Department of Botany of the British Museum.

Our attention is now claimed by a small group of men who played an important part in the development of American botany. They were born, and died, in foreign lands, but they spent years in the active botanical exploration of the United States as then limited, and their labors resulted, in each instance, in the publication of a monumental work upon the North American flora.

André Michaux, a Frenchman, already well known for his

FRANÇOIS ANDRÉ MICHAUX, 1770–1855.

(Daguerreotype, 1851.)

botanical travels in Europe and the Orient, landed at New York late in 1785, and spent more than ten years in America, traveling throughout the known parts of the country from Hudson Bay to Florida, and as far west as Kentucky and the Cumberland settlements. On his travels he was sometimes accompanied by his son, François André, who was only fifteen years old upon their first arrival. During all these years, although for a part of the time he was engaged upon a political mission for the French government, Michaux seems to have had in mind the accumulation of material for a general flora of North America, and when he returned to France in 1796 he carried with him an herbarium of North American plants such as had never before been brought together. His flora was edited by the famous French botanist L. C. Richard, and published at Paris in 1803; meanwhile the man whose labors had made this great undertaking possible of accomplishment had lost his life on the island of Madagascar.

The son, François André Michaux, revisited America in the years 1801–03, traveling through the then extreme west, Ohio, Kentucky, and Tennessee. He afterwards published an elaborately illustrated history of the forest trees of North America, and several other works relating to our flora; and, at his death, in 1855, he left to the American Philosophical Society a fund for the development of American arboriculture.

Frederick Pursh was a native of Saxony. He came to America in 1799, and spent nearly twelve years here, engaged much of the time in botanical collecting trips. He traveled principally on foot, and without companionship save perhaps that of a dog. According to his own statements, he was as far to the northeast as New Hampshire and as far south as the mountains of North Carolina, but as far as collateral evidence is concerned there is no proof that he was farther northeast than Vermont or farther south than southern Virginia; and, unfortunately, the reputation of Frederick Pursh for strict veracity is not of the best. In the course of his travels, however, he made the acquaintance of nearly all the botanists then living in this country, and was permitted to examine all the herbaria then existing here; and, upon his return to Europe, he found in England, where he made his

home, several fine herbaria of North American plants. In England, in 1814, he published his flora of North America, which was the second (and last successful) attempt to comprehend in a single work descriptions of all known North American flowering plants. A few years later Pursh began the exploration of Canada, with a view to the preparation of a descriptive Canadian flora, but before this was accomplished he died, at Montreal.

Thomas Nuttall was an Englishman who, when he came to America in 1808, at the age of twenty-two, had no knowledge of botany, and received his first lessons in that science from Professor B. S. Barton, to whom he had applied for information concerning an unfamiliar plant. Yet he became a great enthusiast in the pursuit of botanical knowledge, and only ten years later he published his famous work on the genera of North American plants, which gave him a place in the first rank of the botanists of his day. Meanwhile he had made excursions to various parts of the country east of the Mississippi, and one far up the Missouri, utilizing the inclement winter seasons for working up his collections at Philadelphia. Nuttall continued botanical work in this country until 1841, when he returned to England, where he spent his remaining years, with the exception of a brief visit to Philadelphia in the winter of 1847–48.

By the time Nuttall's work on the genera of North American plants appeared, in 1818, there had sprung up two vigorous centers of botanical activity in this country, one at Philadelphia, the other at New York. In discussing these, we shall find it convenient to take up the Philadelphia group of botanists first. This was doubtless directly influenced by the earlier work of the Bartrams and of Marshall in that vicinity.

Henry Muhlenberg was a Lutheran clergyman, born in Pennsylvania, but educated in Germany. He did not take up the study of botany until he was nearly thirty years old, about 1782 or later. His home was at Lancaster from this time until his death in 1815, but he is mentioned here because his botanical associations were chiefly with the younger workers of Philadelphia. By his thorough work, his publications, his collections, and his correspondence with European botanists, he did much to advance the knowledge of our flora.

Dr. Benjamin Smith Barton, a native of Pennsylvania, who had received his medical education at Edinburgh and Göttingen, became a professor in the University of Pennsylvania in 1790, at the early age of twenty-four, and continued to occupy this chair until his death twenty-five years later. His position gave him much prestige, and his contributions to the advance of American botany are to be measured less by his published work than by the influence of his botanical lectures, and the sympathy and financial support given by him to other students, such as Pursh and Nuttall. His nephew, Dr. William P. C. Barton, also became a well-known botanist.

One of Dr. Barton's students, whose interest in botany seems to have been first aroused, however, by Humphry Marshall, was Dr. William Baldwin. Dr. Baldwin had already visited China before he received his professional degree in 1807, and within the next ten years he traveled extensively in the southern states, and as a surgeon in the United States Navy visited various South American ports. In 1819 he joined a government expedition for the exploration of the upper Missouri, and died before they were well under way. His published papers were few, but his notes and memoranda were very useful to contemporary workers, and his memory is kept green by the publication of a volume of his letters by his friend, Dr. Darlington.

Dr. William Darlington was another physician who enjoyed the inspiration of Barton's lectures, and in spite of his arduous labors as a member of Congress and in various other public and semi-public positions, devoted much time throughout a long life to botanical study. His flora of his home county of Chester, which went through three editions, was a model local flora which in some respects has never been surpassed. He was deeply interested in such subjects as those we are discussing to-day, and it was through his efforts and under his editorship that the literary relics of Bartram, of Marshall, and of Baldwin, were rescued from oblivion.

Lewis D. de Schweinitz was a Moravian preacher, a native of Bethlehem, Pennsylvania, where he spent most of his life. He was educated in part, however, in Austria and Germany; although

his study of botany was begun before he left America, his first published work was in collaboration with Professor J. B. Albertini, of Niesky, in upper Lusatia. His chief interest was in cryptogamous plants, particularly fungi, and he was the first American specialist in this group of plants. Although his published works were few, they were fairly voluminous, and are of great importance.

The leader of the New York group of botanists was Dr. Samuel L. Mitchill. He was a naturalist of broad interests, and never published any botanical work of consequence, yet he exerted such a remarkable influence upon the young men he gathered about him that no student of the history of botany in this city could fail to recognize in him a great pioneer. When a handful of young enthusiasts gathered in 1817 to organize the Lyceum of Natural History, now the New York Academy of Sciences, the only candidate considered for president was their beloved professor, Dr. Mitchill, and he retained his interest in the institution until his death. At various times Congressman, Senator, and College Professor, his is a striking figure in the history of natural science in this vicinity.

A contemporary of Dr. Mitchill was Dr. David Hosack, a New York boy, a graduate of Princeton, who pursued his medical studies in Scotland and England, and while there acquired a taste for botany, and received some training in that science from William Curtis and Sir James E. Smith, the famous English botanists. Soon after his return to New York he established the first botanical garden in this city, a short distance north of where the Grand Central Station now stands. A hundred years ago this Elgin Botanic Garden was one of the show places of the city; in 1811 it was sold by Hosack to the State of New York, and three years later was granted to Columbia College. The grant did not require Columbia to maintain the Garden as such, and it was soon diverted from its former uses; with the later marvellous rise of real estate in that vicinity, it became the foundation of Columbia's prosperity.

Among the founders of the Lyceum were several young men particularly interested in botany, among them LeConte, Eddy, Knevels and Torrey. Of this number Dr. John Torrey became

most renowned in after years. His first important botanical work was performed as a member of a committee appointed by the Lyceum to prepare a flora of the region around New York City. This report, chiefly Torrey's work, was afterward published, and was the first of a long series of important works, which won for Torrey universal recognition as the foremost American botanist of his day. He was for many years a professor in the College of Physicians and Surgeons, and died at the age of 76, universally beloved.

As Torrey had been one of the young men drawn together by the magnetic personality of Dr. Mitchill, for the establishment of the Lyceum, so he was in turn the center of attraction for the group who, nearly sixty years later, founded the Torrey Botanical Club. The leading spirit in this later movement was William H. Leggett, who acted as editor of the Bulletin of the Club from its commencement in 1870 until his death in 1882. The Torrey Botanical Club as an organization and through the efforts of its members was in turn largely responsible for the establishment of the New York Botanical Garden and the erection of the building where we are met to-day.

One of the early botanists of the Lyceum was Professor C. S. Rafinesque, and we may as well refer to him at this point, although by nature and by fate he was a cosmopolitan. His father was a French merchant, his mother was of German extraction, he was born in a suburb of Constantinople and spent most of his early years in Italy. He was a precocious child, becoming familiar with various languages and more or less acquainted with various sciences at an early age. As a young man he spent several years in America; then several years in Sicily; in 1815 he returned to the United States, where he spent the remainder of his life. He was in many ways the most striking figure to be found in American botany; brilliant, but erratic; undervalued, misunderstood, and misrepresented by his contemporaries, yet deserving by his rashness and the superficiality of his work many of the harsh criticisms with which he was assailed. As professor in Transylsylvania University, he was the first resident botanist west of the Alleghanies. His later years were spent in Philadelphia, where

he died in poverty and almost friendless. Most of his numerous publications might better never have been written, yet with the dross are occasionally to be found grains of pure gold, and the present generation is inclined to put a more just estimate upon the work of Rafinesque than has hitherto prevailed.

Amos Eaton was the first great popularizer of botany in this country, and in tracing back the history of any American botanist of the past century we are as likely as not to find that Eaton was, botanically speaking, his father or grandfather. Eaton was a teacher, and was always full of enthusiasm of such a contagious character that his pupils found it irresistible. Wherever he went he inspired others with the same interest in natural science that he felt himself. None of his predecessors could be compared with him in this respect except perhaps B. S. Barton, and Barton's personality was cold and formal when compared with that of Eaton. His manual, prepared specifically to meet the needs of the amateur, was popular for many years, and went through eight editions. The last eighteen years of his life were chiefly occupied with labors incident to the establishment and administration of the Rensselaer Polytechnic Institute, at Troy. Among the many inspired by him was Mrs. Almira H. Lincoln, afterwards Mrs. Phelps, whose text-book did so much to popularize the study of botany.

At this time there was no group of botanists in New England comparable to those in Philadelphia and New York; yet at least two New England botanists of this period should be mentioned. One was Dr. Jacob Bigelow, author of a Boston flora which appeared in three editions. He was one of the most famous of Boston physicians, and lived to be nearly 92 years of age. The other was Professor Chester Dewey, well known for his work on the difficult genus Carex.

Another man who was doing remarkable work at about the same time was Stephen Elliott, of Charleston, South Carolina. Isolated from most other botanists, with meagre facilities for the prosecution of scientific work, occupied much of the time with his duties as a member of the legislature of his state, he nevertheless published, at intervals, beginning in 1816, a descriptive

flora of South Carolina and Georgia which challenges our admiration.

We now come to a new era in the development of American botany. Hitherto most American botanists had been interested in other natural sciences as well, and in so far as they had devoted their attention to botany they had covered essentially the same ground. Morphology and physiology were still in the background, but although taxonomy held the field, specialization was the order of the day.

The acknowledged leader of American botany during this period was Dr. Asa Gray. At first in New York, and later for many years at Harvard, he made a name for himself as a man of sound scholarship, of broad culture, and of commanding personality. He seems, however, to have been jealous of his own preeminence, and to have discouraged successfully every possible rival in his chosen field. Few indeed, during a period of many years, were the Americans who ventured to differ with him upon any botanical matter on which he had expressed an opinion. His assistant at Harvard in his later years, and his successor, was Dr. Sereno Watson, a man of similarly scholarly attainments.

In one line, however, Gray had a worthy rival. Alphonso Wood possessed neither the talents nor the advantages of Asa Gray, but his class-book of botany always disputed with Gray's manual the right to popular approval as a working reference book upon the flora of the northeastern United States. Nor was Wood's work patterned after that of Gray; its first edition appeared several months earlier, and its later editions covered a considerably larger field, while the author always persisted in giving clear expression to his own views. Dr. Alvan W. Chapman, on the other hand, who wrote the well-known flora of the southern United States, was an author in little more than name, the absolute authority of Dr. Gray being recognized throughout the work.

During the years when Dr. Gray monopolized nearly all of the work on the taxonomy of flowering plants in this country, there arose a number of specialists in plant-groups in which he took little interest — for he realized that it was impossible for one man

to cover all the ground — who, as a rule, coöperated with him in their work. Among the specialists in groups of flowering plants were M. S. Bebb, who did notable work with the willows, having at his home in Illinois a remarkable salicetum where he was able to compare the various species in a living state; George Thurber, best known to botanists as a grass student, although most of his time was devoted to editorial work in agriculture; and George Vasey, also a specialist in the taxonomy of grasses, and for years the botanist of the United States Department of Agriculture.

In ferns, the one prominent name was that of Daniel C. Eaton, for thirty years professor of botany at Yale; he was a grandson of Amos Eaton, whose wonderful influence upon American botany has been mentioned. Among moss students, we may refer to William S. Sullivant, who was the pioneer in the work upon this group of plants in this country, and Thomas P. James, who assisted Leo Lesquereux (of whom more later) in the preparation of the manual which is even now the only book of its kind for the identification of all then known American mosses. In the study of the Hepaticae, Coe F. Austin was the pioneer; his home, at Closter, New Jersey, was in a region peculiarly rich in its hepatic flora.

Among the specialists in Algae we may mention Dr. Francis Wolle, a Moravian clergyman, who published several books dealing chiefly with freshwater forms. Almost the only American student of lichens, for many years, was Professor Edward Tuckerman, of Amherst College. The most prominent mycologists of this period were Rev. M. A. Curtis, an Episcopalian clergyman, and Henry W. Ravenel, a planter, and since their work, as well as much of that of Schweinitz, was done in the southeastern states, the fungi of that region were better known forty years ago than those of any other part of the country.

As an example of the few palaeobotanical students of this period we may mention J. S. Newberry, geologist of several government exploring expeditions, state geologist of Ohio, and for twenty-four years professor in Columbia University. A unique position, as one who was at the same time a botanical

CHARLES WILKINS SHORT, 1794–1863.

(Daguerreotype, 1853.)

horticulturist and a horticultural botanist, was occupied by Thomas Meehan, of Germantown, Philadelphia; his botanical work always betrayed his lack of scientific training, but contained much of permanent value.

The remarkable immigration to this country from central Europe during the thirties and forties, influenced largely by political conditions, had a pronounced effect upon American botany. Dr. George Engelmann, from Germany, became the pioneer of botanical work in the Mississippi valley, and established a botanical center at St. Louis which has been increasing in influence ever since. Dr. Leo Lesquereux, a Swiss, was for many years the foremost American student of fossil plants and of mosses. Two men of German birth, Dr. Charles Mohr, of Mobile, and Dr. Augustin Gattinger, of Nashville, became noted for their work upon the flora of their respective states.

In a discussion of American botanists, we must not overlook those who are best known for field work, but of this class we can only mention a few. Perhaps the first person in this country to become noted for the excellence of the herbarium material distributed by him was Dr. Charles W. Short, of Kentucky. Dr. Charles C. Parry is best remembered for his field work throughout the west, upon various government and private expeditions. H. N. Bolander and Thomas Bridges were among those who did notable work in the botanical exploration of California. But the prince of American plant collectors of former days was a modest Connecticut Yankee, Charles Wright, who devoted twenty years to work in the southwest, in Mexico, in China, and in Japan, and another ten years to the botanical exploration of Cuba.

Nor can we omit mention of those who, although busily engaged with other occupations, have found time to do valuable work upon the flora of the regions in which they have made their homes. Such a one, for instance, as Charles C. Frost, the shoemaker of Brattleboro, who had "more friends among the educated people of Europe than in his native village." Another such was John Williamson, of Kentucky, who with his own hands produced those beautiful etchings now so highly prized by American fern students.

The day of usefulness of amateur work in botany, such as that of Frost and of Williamson, has not passed. The limits of our topic forbid the mention of the names of the living, but even now there are farmers, and merchants, and professional men, who by devoting their leisure moments to serious study are notably advancing botanical science.

JOHN HENDLEY BARNHART.

A "CENTURY PLANT" IN BLOOM.

Visitors to the Garden may now have the unusual experience of seeing a large species of agave in bloom. The plant is in the court of the public conservatories, range no. 1, and forms part of the collection of American desert plants installed there during the summer, moved out from houses nos. 4 and 5. It is at present the most conspicuous object in this collection, as is shown by the accompanying illustration. From the surface of the ground to the apex of the brown flowering stem, which has a basal diameter of about two and a half inches, it is nineteen feet two inches tall, or nearly twice that of Queen Victoria's agave,* about one quarter of this length being occupied by the inflorescence.

As is usual in this genus, the leaves are confined to the base of the plant. In this species they are grey green, flat or somewhat concave, and before the time of flowering of the plant are erect or ascending, while at about the time of the opening of the flowers they become horizontal. The larger of these leaves are about thirty inches long, and at the broadest part, which is at about the middle of the leaf, they have a width of five to six inches, below this point being narrowed to a thicker base three to four inches broad, the very base being abruptly broadened and clasping the stem; the apex is acuminate and is terminated by a rather stout deep brown spine, very sharp and about one and a half inches long; the margins are entire, and are armed at intervals of three quarters to one and a quarter inches with rather stout triangular brown spines which have a broad base and are about one eighth of an inch long.

* For a record of the flowering of this species see Journal 7 : 163 167.

AMERICAN DESERT PLANTS IN THE COURT OF THE PUBLIC CONSERVATORIES.
The tall plant in flower is *Agave Vera-Cruz* Miller.

The brown branches of the inflorescence are horizontal, the larger about one foot long. They are subdivided at the apex, the erect flowers being crowded in clusters at the apex of the divisions. The flowers themselves, as is often the case in this genus, exhale an unpleasant odor and exude a sticky substance. The perianth is about three inches long, green at the base and fading into a yellowish green at the apex of the segments, the free summits of which are three quarters to one inch long and soon withering. The stamens are attached a short distance above the ovary ; the filaments are two and a quarter to two and three quarter inches long, every other one being slightly longer than its mate, making the entire flower, including the ovary and stamens, about four inches long ; the anther, which is about one and a quarter inches long, is versatile, that is, attached to the apex of the filament, so that it vibrates at the least touch. The pistil reaches to about the middle of the filaments or a little above.

The plant was given to the Garden in the autumn of 1900, under the name of *Agave lurida*, by Mr. John Lewis Childs, of Floral Park, Long Island, who has no record of its origin. Specimens and photographs have been submitted to Dr. William Trelease, Director of the Missouri Botanic Garden, who is making a special study of these plants. He reports that it is the plant grown on the Riviera as *Agave lurida*, and should be called *Agave Vera-Cruz* Miller, the older name.

The agaves usually produce "suckers" from the base, these finally producing other plants. The plant of *Agave Vera-Cruz* now in bloom in the conservatory court is producing one of these suckers from the base, but what is very unusual is that this sucker is also bearing flowers. The suckers commonly grow into mature plants before doing this.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. Burton E. Livingston, Staff Member, Department of Botanical Research of the Carnegie Institution of Washington, has accepted an appointment as professor of plant physiology in Johns Hopkins University. He will assume his new duties with the opening of the next academic year. Dr. Livingston carried on investigations at the New York Botanical Garden during 1903 and 1905.

Dr. N. L. Britton, Director-in-Chief, sailed on the S. S. "Lusitania" for Europe August 18. He will spend his time while abroad in making comparisons of a large number of specimens from the West Indies with type material at Kew and the British Museum.

Mr. Fred J. Seaver spent Wednesday, August 5, in the New York State Museum looking over some of the numerous types of fungi in the collections of Dr. C. H. Peck. Especial attention was given to the genus *Hypomyces* the plants of which genus normally occur as parasites on other fleshy fungi. In his studies of fleshy fungi Dr. Peck has added materially to our knowledge of the parasites which occur on such hosts.

Prof. David R. Sumstine, of the Pittsburgh High School, was awarded a research scholarship at the Garden for the month of July. Mr. Sumstine is engaged in a systematic study of the Mucoraceae of North America.

We learn from *Science* that "The College of Agriculture of the University of the Philippines, situated at Los Banos, opened on June 14, with about sixty students. E. B. Copeland is dean and professor in botany; Harold Cuzner, professor of agronomy; Edgar M. Ledyard, professor of zoölogy, and S. B. Durham, professor of animal husbandry. The university opened a school of fine arts in Manila at the same time; it has no entrance requirements, and its registration is above 400. A college of veterinary science for high school graduates was announced to open at the same time but there was only one applicant for admission. The secretary of public instruction, Judge Newton W. Gilbert, is acting president of the university."

Dr. W. A. Murrill, Assistant Director, visited Mountain Lake, Virginia, in July and obtained nearly a thousand specimens of fungi, mostly large fleshy species. This region is moist and heavily wooded, the elevation being over four thousand feet, and its fungus flora has been up to this time practically unknown, although by inference closely related to that of the high mountains of West Virginia and North Carolina.

Tropical Life announces a prize of fifty pounds sterling for an essay embodying research work directed towards ascertaining exactly what changes (together with their causes and whether these changes occur during the fermentation process only or while being dried) take place in the cacao bean between the time that it leaves the pod until it is shoveled into the bag for export. For further information those interested may address the editor of *Tropical Life*, 112 Fenchurch St., E. C. London.

The Botanical Garden of the Johns Hopkins University, situated in the western part of Homewood, Baltimore, is now open to the public, and a brief guide to the grounds and collections has been issued by Professor Duncan S. Johnson as a reprint from the Circular of the University for June, 1909. The garden has been established primarily as an aid to botanical research and instruction in the university, and its arrangement has been planned with this end in view. It is believed, however, that the garden and greenhouse will prove interesting to all members of the university, and to other citizens of Baltimore as well. The garden consists of four sections, illustrating the chief types of vegetative organs, the structure and biology of the reproductive organs of plants, the genealogy of plants as indicated by their classification, and the useful and ornamental plants, chiefly those native to temperate regions. In the further development of the botanical garden, it is planned to illustrate various types of plant associations, some of the important facts of geographical distribution, and the habitat-relations of various plant forms. It is expected that the general planting of the Homewood grounds may be carried out in such a way that the groups of shrubs and trees so used shall have scientific as well as ornamental value.

A plant of the spineless cactus, *Opuntia inermis*, recently collected on Key Largo, Florida, by Dr. Small and Mr. Carter, has just flowered at the garden. It proves to have conspicuously different flowers from its near relative, the spiny *Opuntia Dillenii*. The flower receptacle is very long and the campanulate corolla is salmon-colored.

A series of native economic specimens and a large collection of herbarium material were recently made in the Carolinas by Dr. Rusby and presented by him to the Garden.

During parts of July and August observers of the staff of the Carnegie Institution of Washington established a magnetic station on the grounds of the Garden at a point east of the Bronx River 193.6 feet south southeast of the southwestern corner of the stone hut in the arboretum. At this place the various compasses, deflectors and dip-circles to be used on board the yacht "Carnegie" in her forthcoming cruise to Hudson Bay and across the Atlantic Ocean were standardized by W. J. Peters and J. P. Ault. This was done by comparing them with known standard land instruments. The following quantities were observed by them and are here recorded for future reference:

Latitude = 40° 51′.7 N.
Longitude = 73° 52′.5 W.
Declination = 10°.2 W.
Dip = 72° 03′.8.

Meteorology for July. — The total precipitation recorded for July was 2.75 inches. Maximum temperatures were recorded of 92.5° on the 1st, 89° on the 5th, 92° on the 13th, and 98.5° on the 30th. Also minimum temperatures were recorded of 53.5° on the 5th, 51° on the 9th, 56° on the 19th, and 61.5° on the 29th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

35 specimens of fungi from Ohio. (Given by Prof. A. D. Selby.)

32 specimens of flowering plants from Pennsylvania. (By exchange with Mr. S. S. Van Pelt.)

2 specimens of *Litholepis indica* from Luzon, P. I. (Given by Dr. C. B. Robinson.)

900 specimens of fungi from the vicinity of Mountain Lake, Virginia. (Collected by Dr. W. A. Murrill.)

21 specimens of flowering plants from Delaware County, New York. (Given by Dr. Philip Dowell.)

122 specimens of Mexican mosses. (Collected by Mr. C. G. Pringle.)

90 specimens from the mountains of Jamaica, W. I. (Collected by Miss Alexandrina Taylor.)

250 specimens from Bermuda. (Given by Miss Delia W. Marble.)

1 specimen of fungus from North Carolina. (Given by Prof. F. L. Stevens.)

1 specimen of fungus from Brooklyn, New York. (Given by Mr. J. J. Levison.)

25 specimens of mosses from Europe. (By exchange with Dr. Georg Roth.)

2 specimens of *Halicoryne Wrightii* from the Philippines. (Given by Dr. C. B. Robinson.)

329 specimens of ferns, lichens, fungi and algae from California. (Collected by Dr. M. A. Howe.)

1 museum specimen of lees from France. (Given by Dr. H. H. Rusby.)

400 specimens of flowering plants from Nevada and California. (Collected by Mr. A. A. Heller.)

1 specimen of *Cantharellus Wrightii*. (By exchange with the Royal Gardens, Kew, England.)

25 specimens of fungi from Pennsylvania. (Distributed by the Carnegie Museum, Pittsburgh.)

10 specimens of *Boleti* from Pisgah Forest, Biltmore, North Carolina. (By exchange with Dr. H. D. House.)

1 colored drawing of a fleshy fungus from Jamaica, W. I. (Given by Mr. Wm. Harris.)

6 specimens of parasitic fungi from Nova Scotia. (By exchange with Professor John Dearness.)

24 specimens of polypores from Pennsylvania. (Given by Professor D. R. Sumstine.)

2 specimens of *Secotium agaricoides* from Ottawa, Canada. (Given by Mr. J. M. Macoun.)

PLANTS AND SEEDS.

3 plants of lemon verbena for conservatories. (Given by Mr. M. Richter.)

37 tree ferns from Jamaica for conservatories. (Purchased.)

1 plant of *Ananas Ananas* for conservatories. (Given by Mr. J. V. Borin.)

82 plants from New Jersey for nursery. (Collected by Mr. G. V. Nash.)

101 plants of cacti from California for conservatories. (Collected by W. T. Schaller.)

4 plants of *Cereus* from Germany for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

14 orchids for conservatories. (Given by Mrs. B. B. Tuttle.)

12 plants of *Dryopteris* from Vermont for nursery. (Given by Mr. R. C. Benedict.)

4 plants of *Myriophyllum* for herbaceous grounds. (Given by Mr. Wm. P. Seal.)

39 plants for nursery. (By exchange with U. S. Dep't Agriculture through Mr. G. W. Oliver.)

6 plants of *Cordyline indivisa* for conservatories. (Given by Mr. M. Richter.)

674 plants derived from seed from various sources.

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NEW YORK BOTANICAL GARDEN

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JOURNAL

OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Administrative Assistant

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BRACKET FUNGUS ON TULIP T[illegible]

JOURNAL

OF

The New York Botanical Garden

VOL. X September, 1909. No. 117.

AUTUMN LECTURES, 1909.

Lectures will be delivered in the lecture-hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at four o'clock, as follows:

Sept. 25. "Native Trees of the Hudson River Valley," by Dr. N. L. Britton.

Oct. 2. "Some Floral and Scenic Features of Porto Rico," by Dr. M. A. Howe.

Oct. 9. "The Flora of the Upper Delaware Valley," by Mr. George V. Nash.

Oct. 16. "Collecting Fungi at Mountain Lake, Virginia," by Dr. W. A. Murrill.

Oct. 23. "Autumnal Wild Flowers," by Dr. N. L. Britton.

Oct. 30. "Some Plant Diseases: Their Cause and Treatment," by Mr. Fred J. Seaver.

Nov. 6. "The Reclamation of the Desert in San Bernardino Valley, California," by Dr. H. H. Rusby.

Nov. 13. "The Hudson River Valley before the Advent of Man," by Dr. Arthur Hollick.

The lectures will be illustrated by lantern-slides and otherwise. They will close in time for auditors to take the 5:34 train from the Botanical Garden Station, arriving at Grand Central Station at 6:03 P. M.

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third

Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

THE PROTECTION OF SHADE-TREES AGAINST FUNGI.

The most conspicuous fungi occurring on shade-trees are those that appear as brackets on the trunk and larger branches. These brackets are fruit-bodies; the fungus is within the body of the tree, in the form of delicate branching threads which permeate the tissue in all directions seeking food. A familiar example of this group is the artists' bracket-fungus, a species common on oak, maple, ailanthus and other trees, which is grayish or brownish above and light-colored beneath, changing to dark brown when bruised. It is frequently collected by amateur artists and used for etching.

Another common species is black above, brown beneath, and more hoof-shaped in form. It causes heart-rot of oak, maple and birch. The sulphur-colored polypore is readily recognized by its bright orange cap and yellow under surface. It lives within the trunks of oak, ash, and locust, making the heart-wood dry, soft and very brittle. The locust bracket-fungus is a hard, brownish species common on locust in Virginia and other parts of the south, where it has been much used by the colored people for lighting pipes and keeping fire over night. This fungus may be seen on almost any black locust planted in the vicinity of New York City. It and the locust-borer are rapidly destroying all the larger specimens of this tree.

One of the most destructive fungi found in Europe is the hispid polypore. The writer found it in abundance on plane-trees at Wiesbaden and in Switzerland, and also in London on most kinds of shade-trees. Fortunately, it is still rare in America. The fruit-body is brown and hairy above and yellow below, changing to brown. When treated with ammonia it yields a yellowish-brown dye. The scaly polypore is also abundant on various shade-trees in Europe and likewise occurs but sparingly in the

United States. Its cap is light in color and ornamented with many brownish scales.

Large, branched fungi, grayish or brown in color, are frequently observed growing at the base of oak trees. The most common species is the frondose polypore, well known for its edible qual-

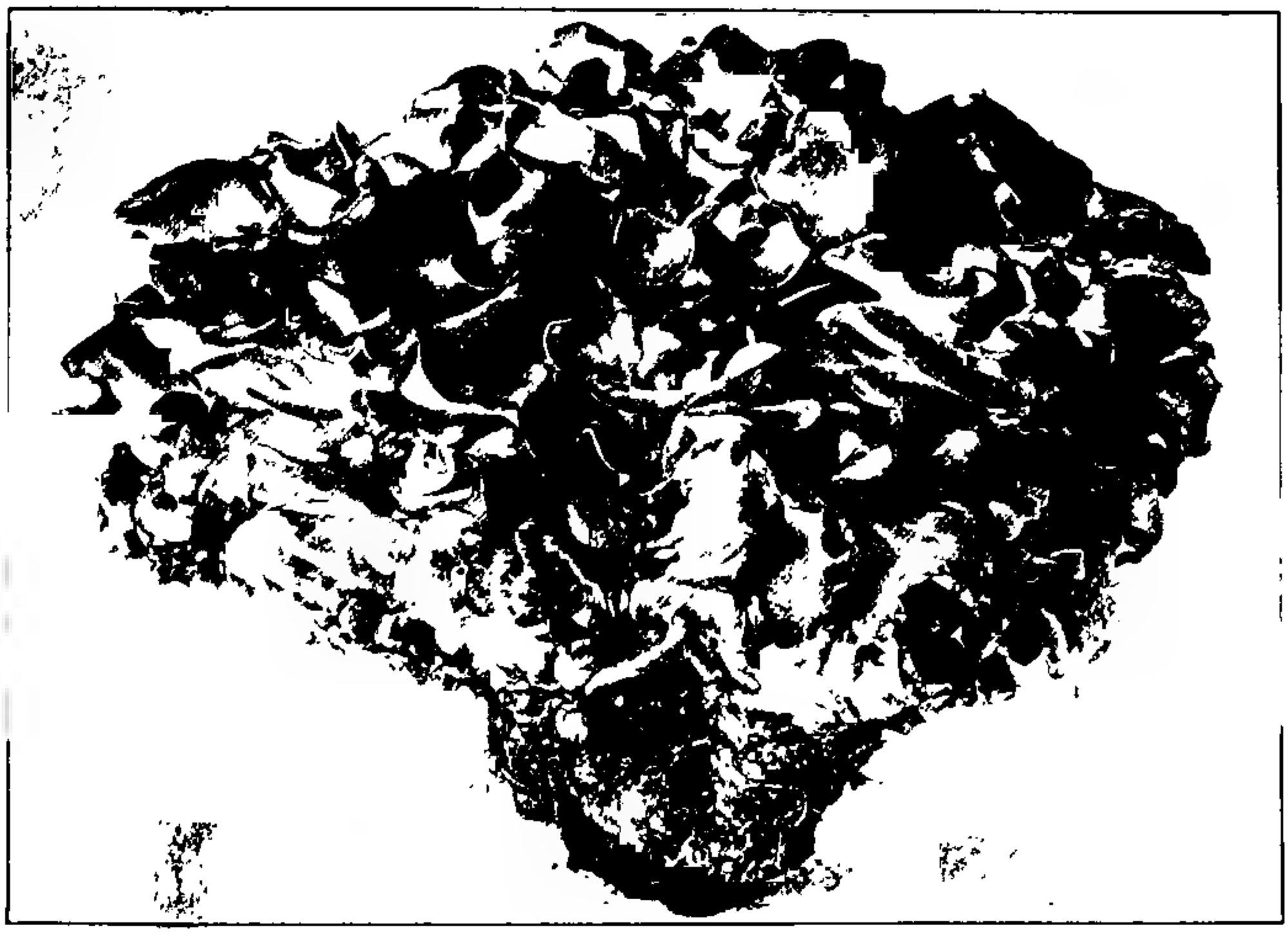


FIG. 30. Frondose polypore from base of oak.

ities, and there are several other species that closely resemble this one. On dead branches and decayed parts of trunks may often be seen clusters of many small, overlapping fruit-bodies, light or dark in color, marked with variously-colored zones. This fungus, the many-colored polypore, causes decay in tree trunks and often produces root-rot in trees when they are weakened by lack of food or other unfavorable conditions.

The oak-loving bracket-fungus, a corky form with peculiar labyrinthiform tubes, is abundant on oak and causes serious damage to the wood of this valuable tree. Besides the species above mentioned, which are only a few of the numerous fungi belonging to the family of pore-bearers, there are many less conspicuous forms of other families which cover decaying portions of trees to

a greater or less extent, enlarging the area of decay and weakening the parts.

Of the gill-bearing fungi, the elm pleurotus and other species of this genus are common on maples and elms in American and European cities. Tufts of fruit-bodies are often seen growing

FIG. 31. Oak-loving bracket-fungus on oak stump.

from imperfectly healed wounds made in pruning. The large elms on Fifth Avenue, at the southeastern corner of Central Park, New York, bear numbers of such clusters nearly every autumn.

A small, hairy, ashy-white fungus with peculiarly split gills, *Schizophyllum alneum*, is frequent on dead parts of shade-trees.

Sections of such parts show that its mycelium is widespread in the wood and that it is more injurious than ordinarily supposed. The most destructive member of this family, however, is the honey-agaric, *Armillaria mellea*. Clusters of the yellow or brown fruit-bodies appear on old stumps and roots of trees, while the whitish or black strands of mycelium are abundant in wood attacked by this species. These strands pass from one root to another beneath the soil, causing their decay and the consequent death of the tree from starvation or its destruction by storms.

Among the lower fungi attacking shade-trees, nectria is conspicuous and important. The numerous, rounded, reddish-colored fruit-bodies appear on dead limbs killed by having their supply of water cut off. The very destructive chestnut-canker, *Diaporthe parasitica*, belongs to this class of diseases. Some species do not kill the limb entirely, but produce cancerous swellings similar to those found on animals. The plane-tree disease is caused by a microscopic fungus, *Gloeosporium nervisequum*, living in the twigs and passing out along the nerves into the leaves as they expand, causing them to turn brown, become dry and fall.

The leaves of trees are very often attacked by mildews, which spread over their surface, and by various spot-fungi, which cause areas of greater or less extent to decay. All of these forms withdraw food from the leaf and exhaust its energy, rendering it incapable of performing its proper functions and often causing its death. Leaves weakened by lack of food and air or punctured by mites are especially subject to attack.

The proper care of the tree plantation consists in attending to the natural wants of the trees so far as soil, water and air are concerned; in guarding them against mechanical injuries; in pruning them when necessary and in the proper manner; and in protecting them against the ravages of insects and fungous diseases. When trees are otherwise properly cared for, the attacks of fungi are usually much less frequent and less harmful. A diseased condition is often induced by starvation; while mechanical injury of any kind is often the first step towards decay.

The entrance of fungi into the trunk of a tree is effected in many ways, chiefly through a wound of some kind. The bite

of a horse, the breaking of a limb, or the tunnel of a boring insect may admit the fungus to the heart of the tree and cause its destruction. If the cambium is scorched by fire or bruised by guy-ropes, it cannot resist fungous attack. Wounds and injuries are thus seen to be of much greater importance than the casual observer would suppose, and it is through the proper treatment of wounds that the ravages of the most destructive fungi are to be prevented.

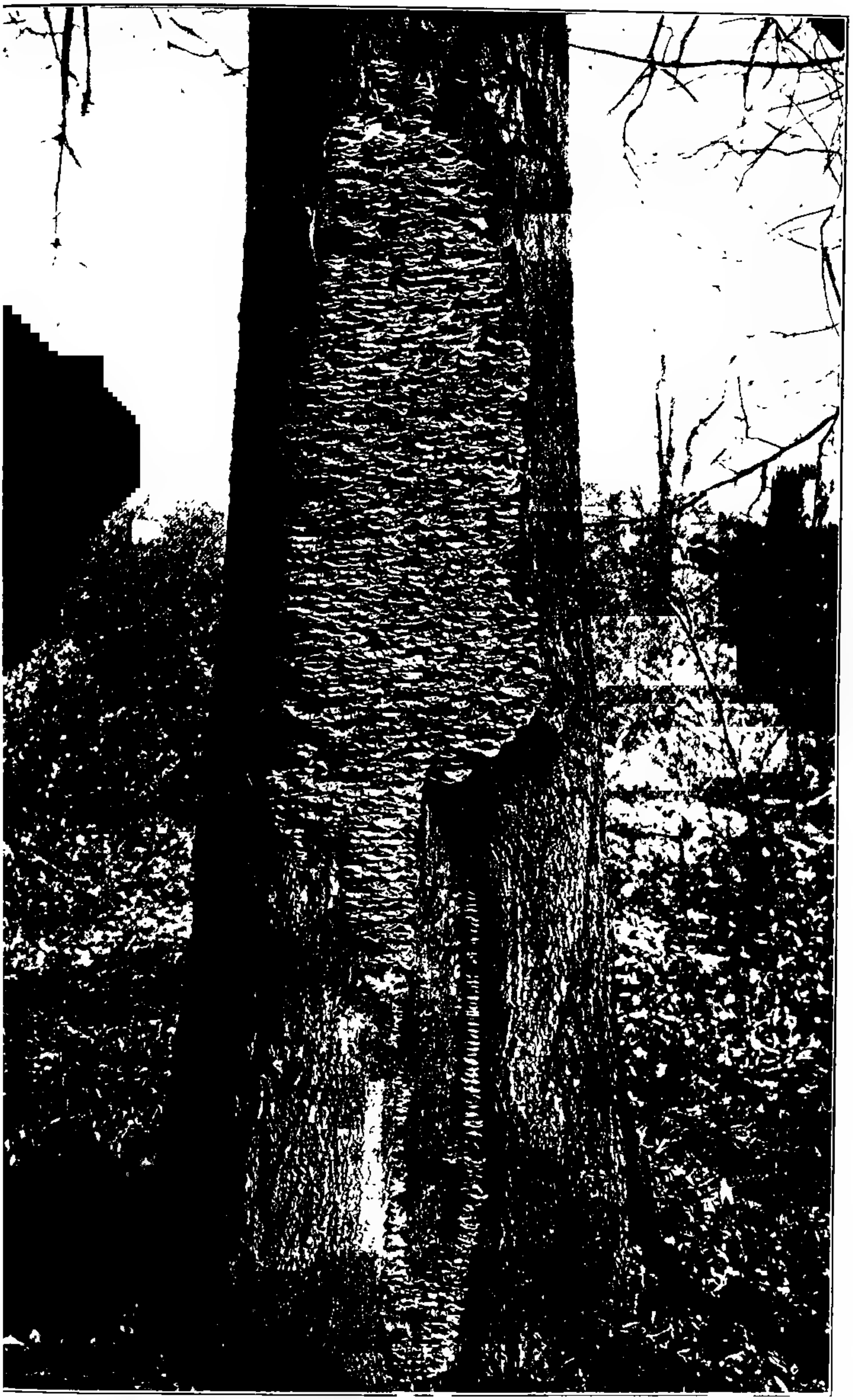
If these fungi are once allowed to enter the body of the tree, no rational way is known of dislodging them. In the treatment of leaf-diseases, it is important to keep the tree vigorous and to burn the affected leaves in autumn. Spraying solutions may be used for certain fungous diseases on small trees, but for large trees their use is hardly to be recommended.

The use of proper precautions will prevent most of the mechanical injuries to which city trees are subject, except those made in the process of pruning. The importance of correct methods in pruning is so great that they are dwelt upon here at some length.

Directions for Pruning.

If a tree has been properly trained in the nursery, very little pruning is needed, and this only for the first few years after planting, during which time the original form is preserved by trimming the fast growing limbs, removing the crooked ones, and shortening those that droop as they become larger and heavier. When one must use an untrained tree, steps should be taken at once to elevate the trunk and encourage the growth of a straight central stem with subordinate branches. The top of a tree should not be allowed to become so dense as to exclude the sun from the soil beneath nor from buildings in the vicinity.

It often happens that trees have been neglected until very large. To bring them into shape requires considerable care, but it should be undertaken if they interfere with the proper use of the street. Old and failing trees may often be stimulated to new growth by judicious pruning. When branches are injured by accident or broken by wind or snow, pruning becomes a necessity. It is also wise to remove all dead branches as soon as they are discovered.



MANY-COLORED POLYPORE ON OAK.

Spring and autumn are the best seasons for pruning. The cold of winter interferes with the execution of the work and also freezes the cambium and prevents the healing of the wound, which should begin soon after the branch is removed. In summer, the leaves are in the way and the removal of branches endangers the life of an equal number of roots, which die for lack of food. Light thinning of the top may be done in summer without injury.

The pleasant weather of autumn makes this season an attractive one for the work of pruning. During the autumn days, also, the roots continue active because the soil remains warm and considerable nutriment is sent up to the buds for the next year's growth. If the pruning is done just after the leaves fall, the remaining buds get the full benefit of all this nutriment. Advantage should be taken of this fact when weak trees are pruned in order to invigorate them. The disadvantage of fall pruning is the checking and possible decay of the exposed wood caused by the severe and changing weather of winter, which follows too soon to allow the inactive cambium to close the wound. Large wounds are never closed in one season, but most of the ordinary cuts made in spring pruning are covered over entirely before the winter sets in.

The best time for general pruning in New York State is in the spring before growth begins, or from the middle of February to the middle of April. Sap-running trees are best pruned from the middle of May to the middle of June. In case fall pruning is preferred, trees that run sap should be finished before the middle of October and other trees after this time. Injured or dead limbs should be removed when observed. The latter are best seen before the leaves fall. Dead branches are unsightly and dangerous to passers-by and to children playing beneath them, while they also endanger the life of the tree by carrying decay into its trunk. A hollow trunk often has its beginning in a neglected dead branch. Dead branches also absorb sap and afford breeding places for injurious insects and fungi.

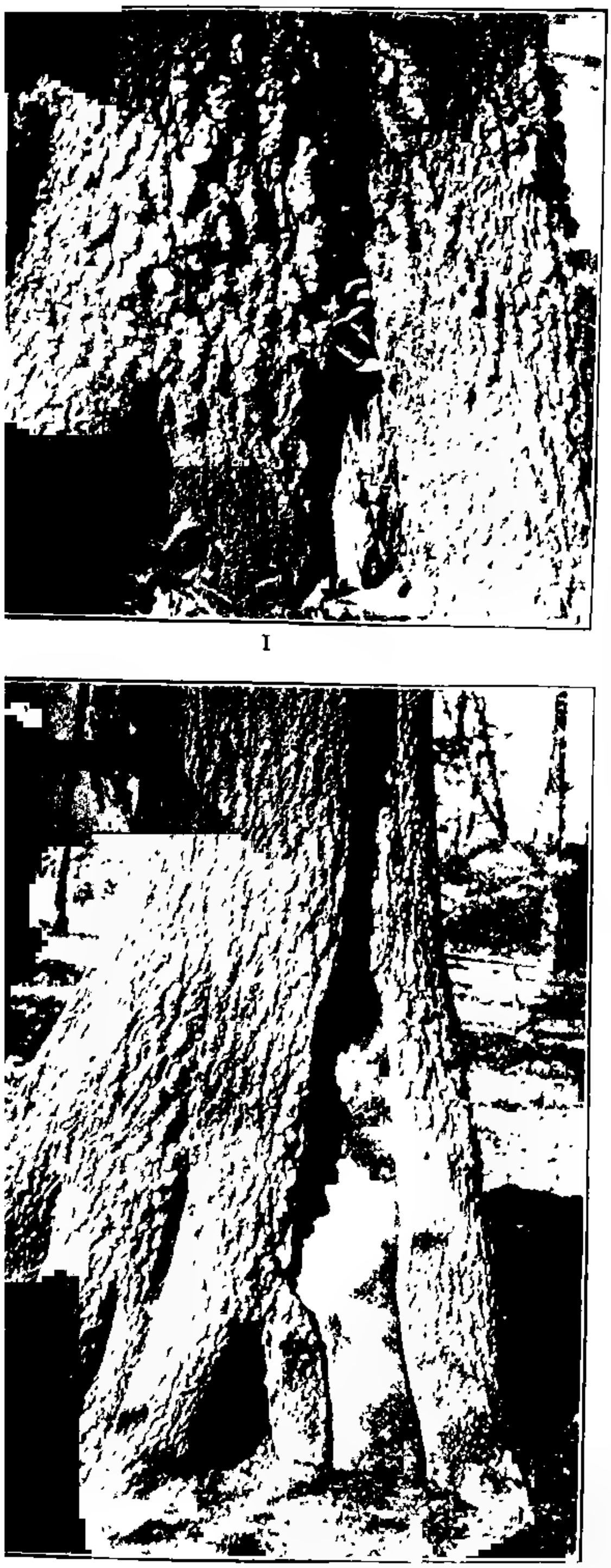
The removal of large branches is always attended with a certain amount of risk and this risk is largely increased when more than one or two are removed during the same season; but if the

wounds are carefully dressed and borers kept out, decay may usually be avoided, though the loss of food cannot be replaced. An overgrown top should usually be corrected by thinning out some of the longer branches. This is better than heading them back, because the effect of the latter process is to destroy the beauty of the tree and to produce a dense, objectionable cluster of branches, as well as to open a sure road for the entrance of disease. The cut end of a branch rarely heals over; the adjacent parts die, and decay gradually extends to the trunk.

Branches to be removed should be cut off *even with the trunk.* This rule should be invariably followed with all trees, conifers not excepted, even though the labor be increased five-fold. When large branches are shortened or removed, splitting and tearing may be prevented by making two cuts, the one beneath the branch being made first, and followed by another above and about a foot farther from the trunk. A dead limb should be cut back even with the shoulder at its base.

The work of pruning is by no means complete until the wounds are carefully smoothed down and properly dressed. This treatment enables the healing tissue to cover the wounds in the shortest possible time and prevents the decay of the wood while healing is taking place. Exposed wood gradually loses water and cracks are produced in which dust and moisture collect and form a substratum for the growth of bacteria and moulds. Later, the spores of larger fungi enter and by developing in this mass of decayed wood become sufficiently vigorous to attack the heart-wood and thus pass into the trunk of the tree.

If some substance is applied to the wound which will prevent the evaporation of water and the consequent checking, decay may be avoided. Various mixtures have been used for this purpose, of which lead-paint and coal-tar are probably the best. Both are antiseptic as well as protective, if applied in thick layers. In case of large wounds, which require several years to heal, it is well to put on a second coat after two or three years. Thin coal-tar is not suitable for this purpose as it does not prevent the evaporation of water. It may be thickened by burning in an iron kettle. Coal-tar does not injure the tissues to any appre-



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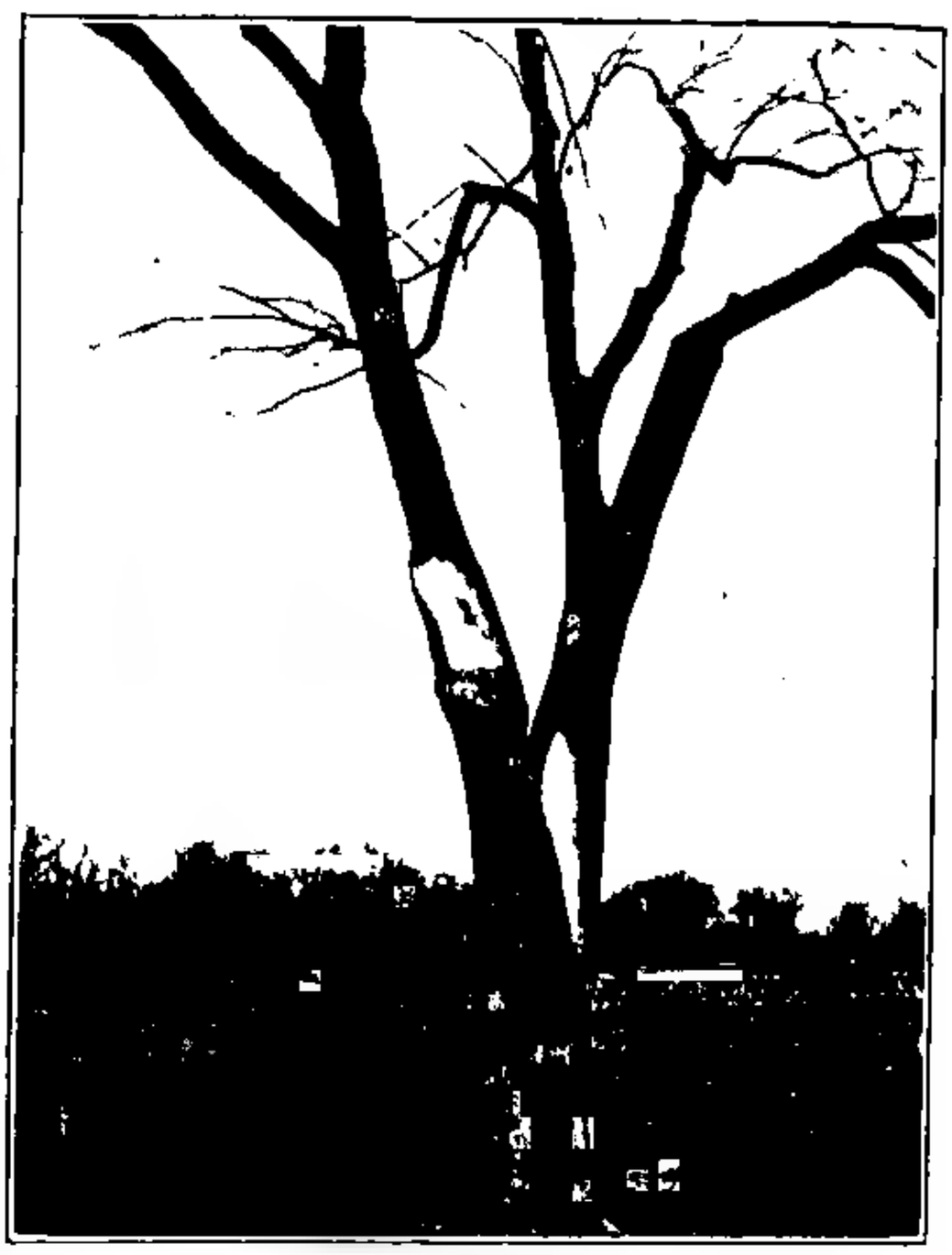

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1. AN OAK TRUNK PARTIALLY DECAYED AT THE BASE.
2. THE SAME TRUNK PROPERLY CLEANED OUT AND FILLED.
3. ANOTHER PARTIALLY DECAYED TRUNK IMPROPERLY FILLED.
4. AN ELM WITH LARGE CAVITIES CLEANED AND FILLED.

ciable extent, since only the surface of the wood is cauterized by it and there is no vital connection between this wood and the callus which covers it. When used on the elm, it is prevented from adhering at times by water-blisters peculiar to this tree. In these cases it should be rubbed off and another coat applied.

Wounds made by accident may be treated similarly to those made in pruning, after the injured tissues have been removed. Split trees should be joined with a bolt instead of a band. Bruised, loosened, or dead bark should be entirely cut away, since it can never aid in repairing the injury, but, on the contrary, encourages decay and prevents the growth of new bark. Decayed wood should be removed and the cavity painted with coal-tar, then plugged with dry oak-wood or cement and this smoothed on the outside nearly even with the trunk and coated with tar. If the cavity is not made thoroughly antiseptic, however, the use of any of these fillings is of doubtful advantage, since the exclusion of dry air and light tends rather to encourage than to prevent decay. In case the tree is hopelessly diseased, anything that will strengthen the trunk or conceal an unsightly wound may be considered advantageous, unless it prevents proper inspection of the tree and in this way becomes dangerous.

W. A. Murrill.

THE AQUATIC GARDEN.

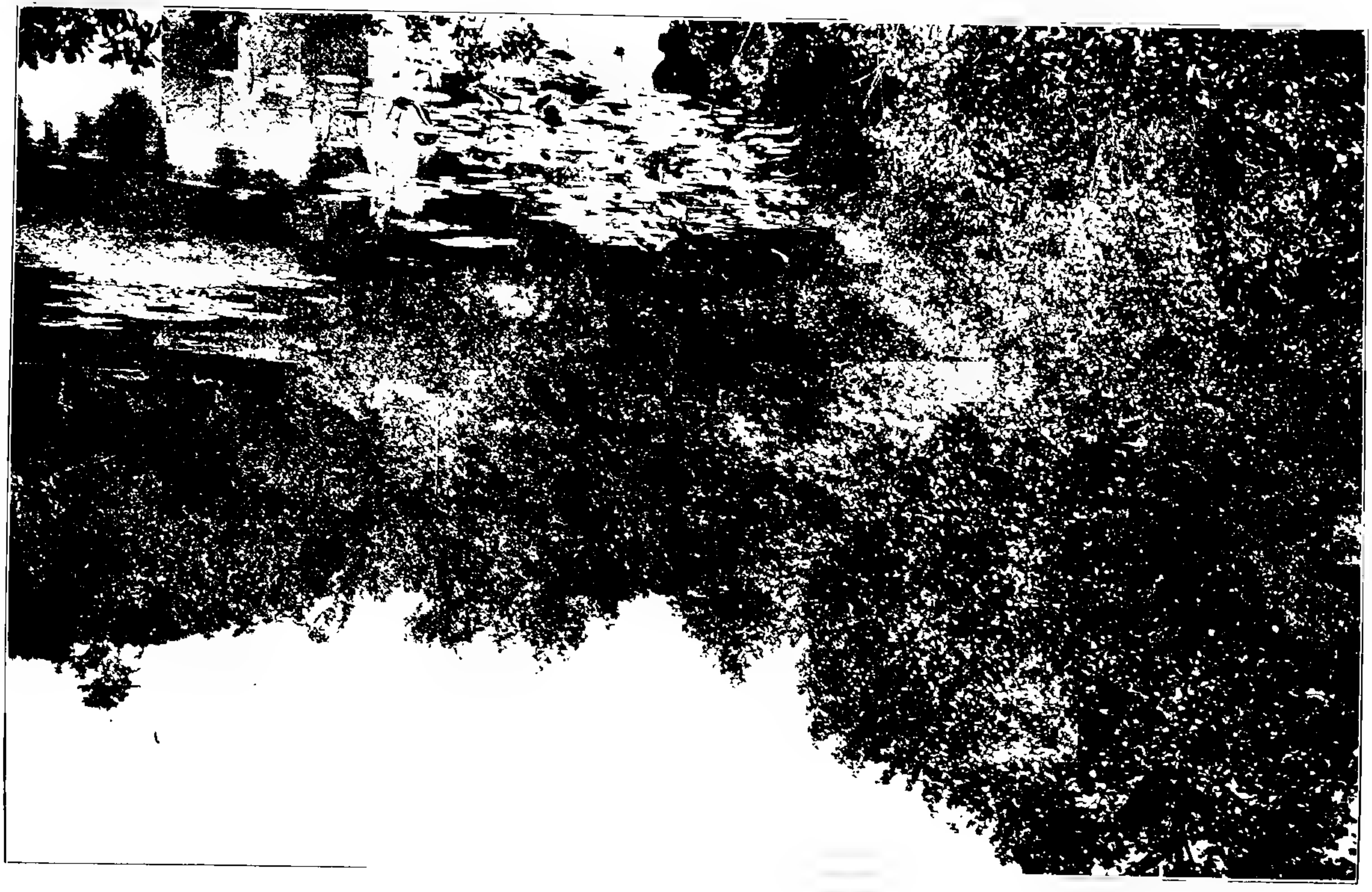
To the north of the Museum Building is a chain of three lakes, occupying a depression separating the fruticetum plain from the region south of it. The western member of this chain is the largest, and the easterly one but a small pond, its eastern brink separated from the Bronx River by a narrow bank. It is the middle lake, both as to location and size, which is the subject of the illustration accompanying this article. This is being developed as an aquatic garden, and, although still in a formative stage, has attracted much attention during the past summer, and still continues an object of interest to visitors.

The view of this lake here presented is that seen from the roadway separating the lakes, from a point just to the north of

the bridge. In the foreground to the left is a group of the native alder, *Alnus serrulata*, common as an original member of the vegetation inhabiting the old swamp, for this aquatic garden now occupies a place formerly filled with tussocks and a tangle of weeds and vines. Upon the method of its transformation I shall have more to say later. Various deciduous trees form a charming background, and in the far distance one can look into the depths of the road leading to the Boulder Bridge and the Hemlock Grove. In the middle foreground is a colony of the American lotus, *Nelumbo lutea*, found originally from the Great Lakes to the Gulf, and as far west as Minnesota and Nebraska, although occurring in a few localities more to the eastward, perhaps by introduction of the Indians, to whom the tubers and seeds furnished an article of food. The little nook it occupies here furnishes a congenial home, and it is thriving. The large flat leaves form a carpet on the water, while the shield-shaped ones lift themselves above the surface on slender stalks, swaying in every breeze, and so disclosing the beautiful shadings of their velvety surface. High above these are borne, in stately manner, the large yellow blossoms, which are followed by the interesting seed-vessels, in which the seeds are encased in receptacles open at the apex.

Further on are groups of water-lilies, of frequent occurrence also elsewhere in the lake, the dainty blossoms floating gracefully upon the surface. A large number of pink ones occupy the waters opposite this point and out of view in the picture. These, to be appreciated, must be seen in the morning hours, for by the middle of the afternoon the blossoms close.

Just around the little point, but in full view from the bridge, is a mass of the rose-mallow, made up of two forms. One of these has a white flower with a deep-colored eye, hence its common name of "crimson-eye" — a feature also giving rise to its botanical name, *Hibiscus oculiroseus*. The other resembles it in general appearance, but has flowers of a delicate shell-pink, but with the same deep eye in the center. This latter form is of especial interest, in addition to its dainty beauty, for it is apparently a natural hybrid originating in the Garden. For many



years two plants have been growing in the herbaceous grounds, the white-flowered one above referred to, and the swamp rose-mallow, *Hibiscus Moscheutos*. Some years ago seeds were collected from both of these plants and sown in the nurseries. When the plants derived from these seeds came into flower it was found that some of those arising from the seeds secured from the white-flowered plant had the flowers of a light pink, as described above, intermediate in color between the two species. The hybrid character of the intermediate form is also apparent in its flowering period, which is intermediate between the two species. The first to flower is the swamp rose-mallow, the one with the deep pink flowers, without a dark eye in the center, followed by the hybrid, while the white-flowered form sends out its first blossoms a few days later. The new-comer is certainly a desirable plant, and an addition to horticulture.

On the shore to the right, and out of view in the illustration, is a mass of the swamp rose-mallow, its bright deep pink flowers a conspicuous feature of that part of the shore. Not far from it is a colony of the glowing cardinal-flower at home in its swampy surroundings. There are many other attractive swamp plants to be found here, including the arrow-heads, the cat-tails, the pickerel-weed, the wild roses, and sweet pepper-bush, but these cannot all be mentioned. Let those interested visit the aquatic garden from time to time, for it presents an ever-changing aspect, except for the dainty water-lilies which send forth their delightful blossoms the summer through, until frosts cut them down. Additions are being made from time to time, thus increasing the interest of repeated visits.

A word now in fulfillment of my promise as to the method of transforming this old swamp into an aquatic garden. An old stream found its way through this little transverse valley, broadening out here and there into swampy areas. One of these areas is represented by the aquatic garden. A dam was placed in this little stream near its lower end, and the banks strengthened, thus raising the level of the water until it flooded the tussocks, in which the swamp abounded, and the other vegetation. During the summer the vegetation was kept cut below the

surface of the water, so that the plants, being deprived of their supply of air, soon perished. One summer of such treatment practically eliminated this mass of vegetation. How much easier is this method than the old way of digging out the tussocks by hand with mattock and ax, at great expense and much labor. It makes the transformation of an old swamp into an aquatic garden quite possible at comparatively slight expense and little labor. There are many such swamps in and around New York City, where mosquitos breed and spread the pestilence of malaria, which might readily be transformed from their present unsightly appearance into objects of beauty and interest.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. E. J. Durand, instructor in botany in Cornell University, spent the last two weeks of August at the Garden, consulting the collections of fleshy discomycetes in preparation of manuscript for "North American Flora."

Mr. W. W. Eggleston left August 26 for North Carolina, where he will devote several weeks to botanical exploration.

Miss M. F. Barrett, instructor in the State Normal School, Montclair, N. J., was in residence at the Garden during the month of July, preparing a monograph of the North American species of gelatinous fungi.

Miss Lewanna Wilkins, of the Eastern High School, Washington, D. C., spent the latter part of July and the first two weeks of August at the Garden, continuing her studies on the family Solanaceae.

Mr. Norman Taylor, assistant curator, spent four weeks during July and August in making collections of material for the local herbarium. Two weeks were spent at Windham, Greene County, New York, which was used as a base for excursions projected into the surrounding country. New Baltimore, also in Greene County, was visited during the last two weeks. Collections were made there along the northerly county line, on the islands in the Hudson River, and from Poelsburg, Columbia County, New

York, where a few hours were spent. Between seven and eight hundred specimens were obtained during the month, about two hundred of which will be available for exchange.

Number 23, Vol. VII., of the *Bulletin of the New York Botanical Garden*, containing an illustrated guide to the grounds, buildings and collections of the Garden, to which is appended a descriptive list of the native trees of the Hudson River Valley, was issued August 27, 1909. This bulletin is published in co-operation with the Hudson-Fulton Celebration Commission. It will be distributed free to all members of the Garden and an edition will be sold on the grounds at twenty-five cents a copy.

Circular No. 35 of the U. S. Department of Agriculture, by Perley Spaulding, deals with the causes and distribution of the white pine-blights in the United States. During the last five years complaints of white pine leaf-blight have been coming in, which complaints are becoming more frequent from year to year. The case is of special importance since we are now dependent upon second growth of white pine for our lumber supply, and the young white pine is especially susceptible to diseases which may result from the most trivial wound.

The blight is characterized by the death of the apical portion of the leaf which may extend over one fourth or one third of its length or entirely to the base, causing premature falling of the leaves. During the early stages of the disease the leaves become reddish-brown, but a few months later the color fades so as to be much less conspicuous, which change of color is likely to be mistaken for an improved condition of the disease.

The leaf-blight is known to extend from the southern part of Maine and northern New Hampshire and Vermont to the Hudson valley, central Pennsylvania and along the Alleghanies to western North Carolina, but apparently does not occur in the higher altitudes of the north, as it has not yet been found in the Adirondacks.

Several species of fungi have been found to accompany the blight, any one or all of which may have to do with its existence. Such physiological factors as winter-killing, sun-scald, injurious

gases, etc., may or may not be concerned. The disease may cause the death of the affected trees in a single season or it may require two or more seasons to accomplish its purpose.

A study of the disease seems to indicate that comparatively few trees have been killed and timber owners have no occasion for undue alarm, as in many cases the trees show a tendency to recover from the blight. There is at present no known reason for cutting healthy trees of young pine among which are scattering trees affected by the leaf-blight.

Dr. William W. Ford, of the Bacteriological Laboratory of Johns Hopkins University, delivered an address before a special meeting of the Boston Mycological Club, June 14, 1909, on the distribution of poisons in mushrooms, which was printed in *Science* for July 23. Dr. Ford has carefully investigated and experimented with a number of species of mushrooms in recent years, and his conclusions, as given in this address, probably represent the most reliable information on this subject at the present time.

The deadly *Amanita phalloides*, with its several varieties, was found to contain two poisons, one active in the raw plant only and the other resisting both cooking and digestion. Atropine is still considered a perfect antidote for muscarine, found in *Amanita muscaria*, but another poison may perhaps be present also in this species.

Amanita rubescens and *A. solitaria* contain the same blood-destroying toxin found in uncooked plants of *A. phalloides*, but this is destroyed by heat. On the other hand, this poison is absent in *A. strobiliformis*, *A. chlorinosma*, *A. radicata* and *A. porphyria*, and the deadly and resistant amanita-toxin is present in quantity. *A. Frostiana* has not yet been proven poisonous, which indicates that it is quite distinct from *A. muscaria*.

Russula emetica is mentioned as a strong irritant; *Helvella esculenta* contains a poison similar to that found in uncooked *A. phalloides;* certain phalloids of fetid odor are uniformly fatal to hogs; species of *Volvaria* are questionable; and *Boletus luridus* occasionally disturbs the system for a time, but has a very objectionable taste, which prevents it from being eaten in quantity.

No authentic cases of true poisoning, according to the author, are known among the black-spored or brown-spored agarics. In conclusion, Dr. Ford remarks :

" The examination of these various species of fungi, representing now nearly twenty distinct forms, demonstrates one or two facts which should be particularly emphasized. In the first place, our methods of chemical analysis of mushrooms, and especially the methods of isolating their poisons are now so developed that a little material, two or three small specimens in fact, and even one good-sized plant, may be studied and an opinion be given as to the properties of the species. In the second place, a more extended investigation should be carried out in regard to the properties of all the mushrooms believed on clinical grounds to be poisonous, but of which no laboratory study has thus far been made. Finally, such a piece of work, to be of lasting value to Science, can only be accomplished through the coöperation of trained mycologists who can identify with certainty the species of mushrooms selected for study."

Meteorology for August. — The total precipitation recorded for the month was 4.75 inches. Maximum temperatures were recorded of 97° on the 8th, 96.5° on the 9th, 90.5° on the 19th and 92.5° on the 25th. Also minimum temperatures were recorded of 61.5° on the 2d, 55° on the 5th, 52° on the 22d and 47° on the 31st.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

53 specimens of West Indian mosses. (By exchange with General E. G. Paris.)

20 specimens of Boleti from Pisgah Forest, North Carolina. (By exchange with Dr. H. D. House.)

2 specimens of *Inonotus amplectens* from Florida. (Given by Mr. C. H. Baker.)

33 specimens of Polyporaceae from Formosa. (By exchange with Professor S. Kusano.)

2,480 specimens from the Bahamas, W. I. (Collected by Mr. Percy Wilson.)

10 specimens of fleshy fungi from Chappaqua, New York. (Given by Mrs. C. E. Rider.)

8 specimens of fleshy fungi from Monmouth County, New Jersey. (Given by Mr. W. H. Ballou.)

17 specimens of Polyporaceae from Pisgah Forest, North Carolina. (By exchange with Dr. H. D. House.)

220 specimens from New Jersey. (Collected by Mr. Norman Taylor.)

3 specimens of *Marasmius saccharinus* from Porto Rico. (Given by Mr. George L. Fawcett.)

1,535 specimens from New York. (Collected by Mr. Norman Taylor.)

50 specimens of miscellaneous fungi from Chappaqua, New York.) (Given by Mrs. W. A. Murrill.)

3 specimens of *Prunus* from Washington, D. C. (Given by General T. E. Wilcox.)

1 specimen of *Prunus cuneata* from Pennsylvania. (Given by Mr. J. J. Carter.)

50 specimens of fleshy fungi from New York. (Collected by Dr. W. A. Murrill and Mr. F. J. Seaver.)

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12 plants of *Schizaea pusilla,* from southern New Jersey. (Collected by Mr. P. Wilson.)

6 plants of *Dionaea muscipula,* from North Carolina. (Given by Mr. C. L. Pollard.)

1 plant of *Sedum* sp., from California. (Given by Miss M. T. Bryce.)

300 plants of *Azolla caroliniana,* from Clifton, N. J. (Collected by Mr. George V. Nash.)

100 plants of *Azolla* sp., from the Royal Gardens, Kew, England. (Given by Mr. F. L. Stevens.)

1 plant of wonderberry. (Given by Mr. J. L. Childs.)

300 plants of *Wolffia columbiana,* from Clifton, N. J. (Collected by Mr. George V. Nash.)

1 plant of *Dudleya* sp., from Carmel, Cal. (Given by Dr. D. T. MacDougal.)

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1 packet seed of *Clistoyucca arborescens.* (By exchange with the Missouri Botanic Garden.)

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NEW YORK BOTANICAL GARDEN

BRONX PARK, NEW YORK CITY

Vol. X OCTOBER, 1909 No. 118

JOURNAL

OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

OF

The New York Botanical Garden

VOL. X October, 1909. No. 118.

NEED OF ADDITIONAL FUNDS.

(Statement authorized by Board of Managers May 9, 1907, and October 14, 1909.)

As the development of the Garden as a great educational institution proceeds, the need of additional funds to supplement its ordinary income in order to properly expand its work becomes apparent. The Board of Managers now hold three such funds, as follows:

1. A bequest of the late Ex-Chief Justice Charles P. Daly, in memory of Mrs. Daly's grandfather, David Lydig, known as the David Lydig Fund, amounting to $34,149.86, and yielding about $1,365 annual income. By resolution of the Board this annual income is devoted to publication and is of great assistance and value.

2. A gift by the Misses Olivia E. and Caroline Phelps Stokes of $3,000, as a fund for the preservation of native plants, yielding $120 annual income, which is devoted to lectures and literature, advocating the purposes for which the fund was established.

3. Fees paid to the Garden by students registering for special privileges are credited to the Students' Research Fund, which now amounts to about $3,000, and yields about $120 annual income, grants from which are made to aid the investigations of especially meritorious students when required.

Foundations for other objects are greatly desired, and it is believed that they would add much to knowledge. They may bear, in general, such personal designations as donors may desire to indicate.

1. *Exploration Fund.* The obtaining of plants and of specimens of their products, from distant regions little known botanically, for public display and for expert study, is one of the most important duties of the Garden; a fund not less than $250,000, yielding $10,000 or $12,000 annually, is needed.

2. *Horticultural Fund.* In order to develop horticultural work, to promptly secure and exhibit all horticultural novelties, to investigate horticultural problems, to establish and maintain decorative plantations, a fund not less than $100,000 is needed to yield at least $4,000 or $5,000 annually.

3. *Library Fund.* The Library has been built up by gifts from friends of the Garden and is now a noteworthy collection of botanical and horticultural literature. To render it more complete and to permit the purchase of all books published on botany and horticulture, a fund of $50,000, yielding about $2,000 a year, is required.

4. *Conservatory Fund.* For the purchase of rare, large, or otherwise interesting and valuable plants for the public conservatories whenever offered by dealers or collectors, a fund of $50,000 is required, to yield about $2,000 annually.

5. *Herbarium Fund.* The herbarium is the most important of the permanent scientific collections of the Garden, because it provides the necessary means for determining the names, features and relationships of plants. It should be continually increased by the purchase of specimens from collectors all over the world, and a fund of $50,000, to yield about $2,000 a year, should be provided for this purpose.

6. *The Lecture Fund.* Public lectures on botanical and horticultural topics are important educational factors, and the lecture-hall in the Museum Building is provided for this purpose. Money for the preparation of illustrations and the payment of lecturers additional to members of the curatorial staff of the Garden is needed, in order that at least one public lecture a week throughout the year may be delivered. A fund of $25,000, to yield about $1,000 a year, would accomplish this.

7. *Illustration of the "North American Flora."* It is very desirable that illustrations in color of native North American plants

accompanied by descriptive letter press should be published, and the collections at the Garden furnish the specimens needed. The preparation of drawings, their reproduction, and the printing and editing of such a work would need a fund of about $30,000, to yield $1,200 to $1,500 annually. The total cost of issuing sixty to seventy-five plates a year would be about $4,000, but more than half of this cost would be met by subscriptions to the work, and in time they might defray the entire cost.

8. *Scholarship Funds.* For the support of trained deserving students while investigating botanical and horticultural problems. Several such funds from $10,000 to $25,000, yielding $400 to $1,200 annually, could be operated with signal advantage to science.

9. *Laboratory Fund.* For the purchase of apparatus and other materials for the laboratories provided in the Museum Building. The laboratories are most important adjuncts to investigation and they should be well supplied with all necessary equipment; a fund of $20,000 to yield $800 to $1,000 a year is needed.

10. *Fund for Horticultural Prizes.* In order to stimulate the production and exhibition of horticultural novelties, it is desirable that the Garden have a fund of $10,000, to yield $400 or $500 a year for the recognition of such work by experimenters in any part of the world, the prizes to be in money or as medals.

11. *Fund for Botanical Prizes.* In order to stimulate scientific botanical discovery, the power to recognize original observations and other noteworthy contributions to botanical knowledge, by prizes, either in money or as medals, a fund of $10,000 should be provided to yield $400 to $500 annually.

12. *Research Funds.* Several funds from $5,000 to $50,000 yielding from $200 to $2,500 annual income are desired, to be devoted to the solution of unsolved botanical or horticultural problems.

It is also very desirable that the general Endowment Fund of the Garden be increased. The present endowment has been contributed as follows:

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Cornelius Vanderbilt	25,000.00
John D. Rockefeller	25,000.00
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James B. Ford	1,000.00
Francis Lynde Stetson	1,000.00
Hugh N. Camp	250.00
Smaller contributions	160.00
Life Membership Fees	19,500.00
Total	$311,410.00

In preparing a habitation for the Botanical Garden, the city has expended over $1,300,000 upon its buildings, grounds, and roads, and it contributes also to their maintenance as a part of the

park system, for the health, instruction and enjoyment of the people; but for support of the life and soul of the Garden, as a valuable and progressive scientific institution, we must look mainly to the public-spirited citizens of New York. Much has been already done, as a glance at its work will show. The Directors have expended about $350,000 of privately contributed funds and have invested a fund of about $345,000, similarly derived as already stated; and in gifts of plants, books, apparatus and the deposit of collections, have received about $235,000 more, making a total of about $930,000 contributed by individuals.

The Garden has won an honored and a world-wide name for what it has so far done, but it must have means for progress.

Will you not help in this endowment for educational and scientific work? Remittances may be made to either of the undersigned.

C. F. Cox,
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N. Y. Botanical Garden.

In behalf of the Board of Managers of the New York Botanical Garden,

Addison Brown,
Chairman of the Executive Committee.

REPORT ON A VISIT TO THE ROYAL GARDENS, KEW, AND TO THE BRITISH MUSEUM OF NATURAL HISTORY, LONDON, ENGLAND.

To the Scientific Directors,

Gentlemen: Pursuant to your permission to continue investigation of the West Indian flora I have visited the Royal Gardens at Kew, and the British Museum of Natural History, South Kensington, London, England, being absent for these purposes from August 18 to September 18, 1909. My objects were to examine plants and specimens from the West Indies and especially types and cotypes from Jamaica and Cuba, contained in the collections of these two great institutions and to compare

them with specimens secured during our own botanical exploration of these islands, some of which I took with me, for this purpose; also to study certain plants and specimens from the United States and more particularly certain of our trees grown at Kew; to consult some old and rare books not contained in our Library; and to inspect and study portions of the out-of-door collections and those of greenhouse plants at Kew. The time available for these studies was from August 24 until September 10 inclusive. Through the aid and coöperation of the officers of the Kew Herbarium and Library, and of the Botanical Department of the British Museum I was enabled to see very nearly all the specimens and books desired and I am grateful to them for many favors and for much valuable information. Inasmuch as I had accumulated memoranda on more than three hundred different plants and books to be examined, the time which I had allowed myself for this work would have been insufficient, except for this kind coöperation.

Studies of the flora of the Bahama Islands, prosecuted during several years in coöperation with Dr. C. F. Millspaugh, Curator of Botany in the Field Museum of Natural History, Chicago, may now be completed for publication; I am expecting the pleasure of Dr. Millspaugh's presence here in November for this purpose. An account of the wild plants of Bermuda, rendered more complete by recent collections made there by Mr. Stewardson Brown, Curator of Botany at the Academy of Natural Science of Philadelphia, and by Miss Delia W. Marble, may also be made ready.

The older collections at Kew and at the British Museum of Natural History threw much light upon the studies of flowering plants of the Jamaica Flora, carried on in coöperation with Mr. William Harris, Superintendent of Public Gardens and Plantations of that Island, and I have now been able to study specimens or plants of all but about 120 species out of a total flora of over 2,700 species recorded to grow naturally in Jamaica; some of this residuum is represented by specimens contained only in museums of the continent of Europe; some is represented by published records not substantiated by specimens; while some is

probably to be attributed to mistaken identifications. The study of Jamaica orchids by Hon. Wm. Fawcett, late Director of Public Gardens and Plantations, and by Mr. A. B. Rendle, Keeper of the Botanical Collections of the British Museum, now nearing completion, will be of great assistance in this investigation, its publication by the trustees of the British Museum being anticipated within a few months. The annotated catalogue of Jamaica plants prepared by me in coöperation with Mr. Wm. Harris is completed as a rough draft, and I took a copy of this with me, for use in England, but I should now prefer that some additional exploration be accomplished before it is published.

Our studies on the vast flora of Cuba can only be regarded as begun and much field work must be done there before even an approximate knowledge of its plants and of their occurrence and distribution can be obtained. Mr. D. O. Mills, president of the Board of Managers, by a liberal gift to our Exploration Fund, has made it possible to continue exploration there, and I have sent Dr. J. A. Shafer as a collector for six months to the northern part of Oriente Province.

Studies in the botanical library of the British Museum and in that of the Royal Gardens, Kew, emphasized the desirability of increasing our library as rapidly as available funds, and of opportunities for the purchase of books, will permit; I have brought this subject to attention repeatedly and we have made, on the whole, satisfactory progress in building up a large collection of books, but there is still much to be done and many volumes are becoming scarcer and scarcer.

The out-of-door collections of living plants at Kew were, as always, of wonderful interest and beauty. The equable temperatures and consecutive rainfall make possible the growth of several thousand species which cannot endure our climate at all, or will grow only under cultural conditions requiring at present prohibitive expense. I observed many of these for the first time, especially natives of warm temperate regions. Visitors have unrestricted access to nearly all parts of the grounds and depredations and disorderly conduct are prevented and discouraged by a large force of constables continuously on duty, one or more of

these guards being in evidence at almost every point. A noteworthy exception to unrestricted access is the reservation known as "The Queen's Cottage Grounds," a large area of woodland, completely enclosed by an iron fence about five feet high, and circuitously traversed by a grass path about thirteen feet wide which is bordered by wire fences; visitors are thus permitted to enjoy the beauty of the woodland, but not to trespass upon it.

The collection of plants under glass had also been enriched by many species since my last visit. I studied the cactuses quite carefully, and saw a few species not represented in our collections.

I much regretted the absence of Lieut.-Col. David Prain, the Director, at the time of my visit to Kew; he was in attendance upon the meeting of the British Association for the Advancement of Science, at Winnipeg, Manitoba; but I was cordially welcomed by Mr. Hill, Assistant Director, and am grateful to him for much kindness and delightful hospitality. Returning from Winnipeg, Col. Prain visited the New York Botanical Garden, and I had the pleasure of seeing him here after my return.

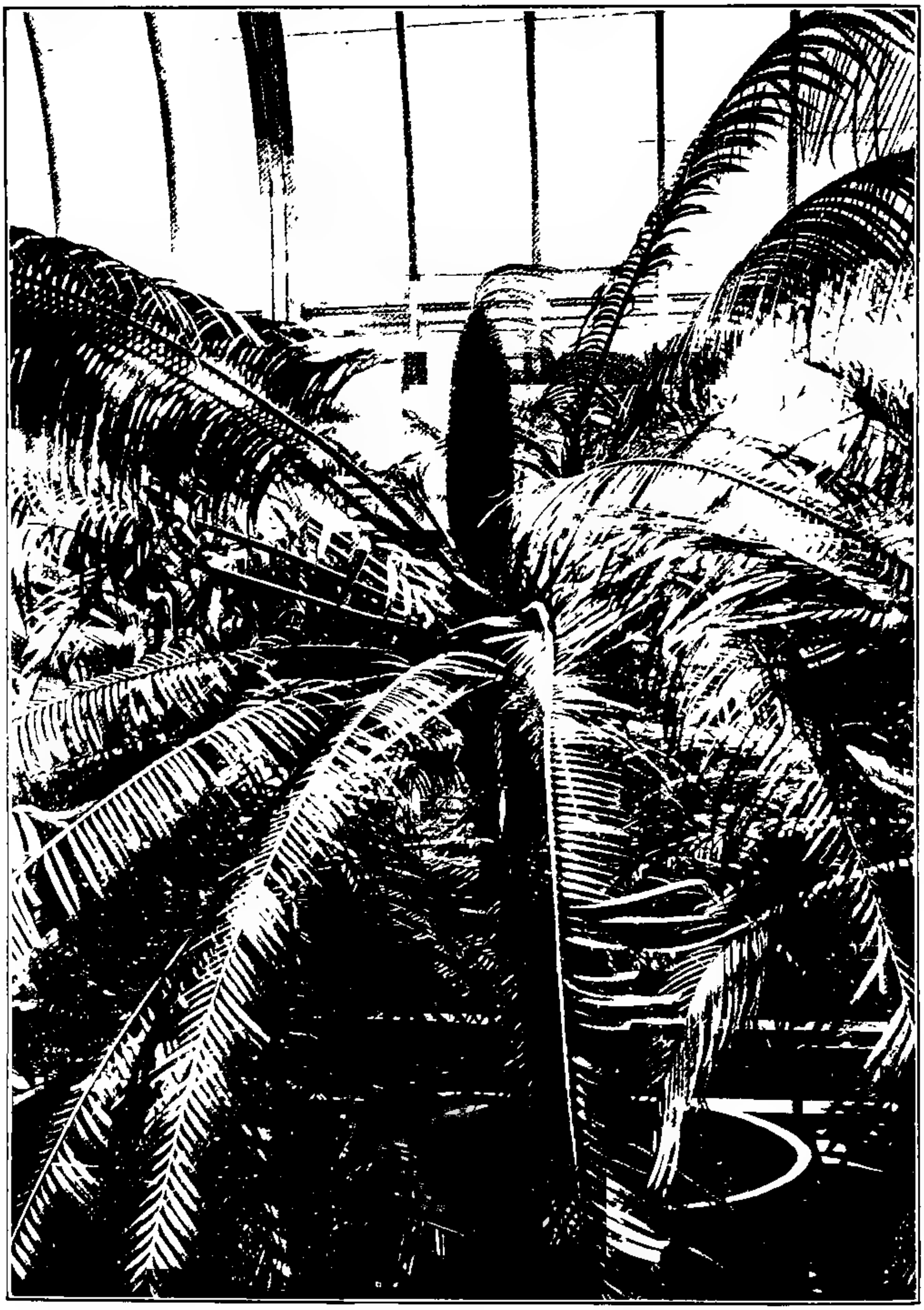
Returning on the steamship "Campania," it was with great pleasure that I met Sir Daniel Morris, formerly Assistant Director at Kew, later Commissioner of Agriculture for the British West Indies, at present a member of a commission charged with the investigation of commercial relations between Canada and the British West Indies. The voyage to New York gave opportunty for several conversations with him on topics of mutual interest; he has always taken much interest in the development of the New York Botanical Garden, and his advice and suggestions have been very valuable. He was able to spend a little time with me at the Garden on the afternoon of September 18.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

September 21, 1909.



Cycas circinalis, SHOWING STAMINATE CONE.

THE CYCAD COLLECTION.

This collection, formerly located in the large palm-house in conservatory range no. 1, was transferred during the summer to its present quarters in the new conservatories, known as range no. 2, located on the east side of the grounds, a short distance to the north of the road leading from the Long Bridge to White Plains Road. The collection is placed in the east house of the transverse range.

The cycads form an interesting group related to the ferns in some particulars, while in others they resemble the gymnospermae, to which belong the conifers. In Mesozoic time they were much more numerous than now, as attested by the large number of fossil remains found, forming a considerable portion of the vegetation of that period in the earth's history. The living species are but reminders of the past, and are rather local in their distribution, no one locality being credited with many.

The cycad family is world-wide in its distribution, being confined, however, to tropical and the warmer temperate regions. It comprises nine genera and between eighty and ninety species. The genera *Cycas*, *Stangeria*, *Bowenia*, *Encephalartos* and *Macrozamia* are confined to the old world, while *Dioon*, *Zamia*, *Ceratozamia* and *Microcycas* are as rigidly restricted to the new.

Of the old world genera *Cycas* is the best known and one of the largest, containing about sixteen species which are spread throughout tropical Asia, Australia, Polynesia, the East Indies, the Moluccas and Madagascar. This genus is represented in the collection by several species. One of these, *Cycas circinalis*, a native of the East Indies, is made prominent at the present time by a large specimen which has developed a staminate cone. The species itself is of common occurrence in cultivation, but of all the specimens which have been in the Garden collection only two have proved to be staminate, all the others being pistillate plants. The difference in form of the inflorescence of the two is very marked, so great indeed that one would hardly suspect either of being the same species as the other, judging from the inflorescence alone. The staminate cone is depicted in the accompanying illus-

tration, made from a photograph of the large plant already referred to. This cone is a most striking object at the present time. It is nearly cylindric, abruptly narrowing above into an acute apex. It has a length of twenty-four inches and a diameter of about six inches; its color is an orange-brown. The individual scales of the cone are obovate-cuneate, with an upturned point about one quarter of an inch long at the apex. On the under surface of these are borne, in great numbers, the pollen-sacs. The pistillate inflorescence consists of a narrow leaf-like toothed organ, with the ovules inserted along its edges.

Among others of this genus will be found large plants of *Cycas revoluta*, a native of China and Japan, and commonly known as the sago-palm. The pistillate plant of this species is very common, while of all the plants which have formed a part of the Garden collection from time to time not one has developed a staminate cone. The leaves of this species, the commonest member of the genus in cultivation, are used for decorative purposes, and large numbers of them are imported yearly from Japan. The Garden desires exceedingly to secure a staminate specimen of this plant.

One of the rarest plants in the collection is *Stangeria eriopus*, native of southern Africa, where it is known as the Hottentot's Head. This plant was described and illustrated in the Journal (**10**: 163, *pl. 62*) in the July issue of this year, on the occurrence of its production of a pistillate cone. This genus is known to contain but a single species and two so-called varieties which perhaps may be of more than varietal rank.

The south African genus *Encephalartos* contains about twelve species, of which at least two are represented in the Garden collection. These are *Encephalartos horridus*, well-named from its vicious-spined leaves, and *Encephalartos villosus*, known as the golden-fruited Kaffir-bread. Both species are represented by large vigorous plants.

Of the known species of the family about one half are from the New World, and the greater part of these, between thirty and thirty-five, are in the genus *Zamia*, found in some one or more of its species from southern Florida, through the Bahamas and

the West Indies to continental tropical America. In the collection will be found plants of *Zamia pumila* and *Zamia floridana*, known as "coontie," both found extensively in certain parts of Florida; at one time considerable starch was manufactured from the underground parts of these plants. A number of other species will also be found in the collection.

Dioon now includes three species, all from Mexico: the old and well-known *Dioon edule*, the more recently described *Dioon spinulosum*, and *Dioon Purpusii*, brought to the attention of scientists the present year by Dr. J. N. Rose, of the United States National Museum. The plant on exhibition in the Garden collection was secured by him, in conjunction with Dr. D. T. MacDougal, in Tomellin Cañon, Oaxaca, in 1906. It is one of the choice plants of the collection.

The genus *Ceratozamia*, also Mexican and containing at present about six species, is represented by two species, *Ceratozamia mexicana* and *Ceratozamia Miqueliana*, the former by two large specimens, the latter by one. The name *Ceratozamia*, which means "horned Zamia," was given to these plants on account of the two horns which are found on each of the cone-scales.

While the cycad collection of the Garden contains many interesting and unusual plants, there are still many species which are without representation, and it is very desirable that these be secured. The present quarters of the family will accommodate many more plants, and it is hoped that other species, not now in the collection, may be obtained by gift or exchange.

GEORGE V. NASH.

REPORT ON BOTANICAL WORK ON THE PACIFIC COAST.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF,

Sir: I have the honor to submit the following report of an extended tour through Canada and the United States, continuing from Tuesday, July 19, to Friday, September 17.

The objects of this tour were considerably diversified. I was to attend the annual convention of the American Pharmaceutical

Association at Los Angeles, August 16 to 21, and selected the northern route in order to see a part of North America which I had never visited. I desired also to join Chief Kebler, of the Drug Laboratory of the United States Department of Agriculture's Bureau of Chemistry, in inspecting the drug supplies of the Pacific coast; to study and collect our indigenous drugs in the interest of the same department, and to collect economic material for our own museum. In connection with the above work, I prepared to make such general botanical collections in the regions visited as my remaining time permitted.

My first stop, July 23–26, was made at Lake Ida, near Alexandria, Minn., where I visited Dean Wulling, of the School of Pharmacy of the University of Minnesota, for the purpose of discussing important matters relating to our system of pharmaceutical education. At this point I found an abundance of *Zanthoxylum americanum*, the northern prickly-ash, and collected specimens of its bark and fruiting branches. I found here also *Brauneria angustifolia*, the root of which is now attracting considerable attention as a drug. An interesting form of *Apocynum hypericifolium* grows upon the shores of this lake, which is apparently identical with one growing upon shores of lakes in southeastern New York. The most important object of search, at this point, was *Polygala Senega*, which I greatly desired to study in the field. To my surprise, I was unable to find this species anywhere in that vicinity, though it is abundant in both the southern and northern parts of the state. Neither the locality nor the season was prolific of collection-material, but I obtained a number of miscellaneous species.

My next stop was at Glacier, British Columbia, in the Selkirk Mts., July 28 and 29. A few species were collected at intervening stations, en route to this point. At Glacier, the conditions for collecting were very favorable, and the afternoon of July 28 was spent in this work. I obtained about seventy-five species, their general character being subalpine, as the glacier extends down to within a few hundred feet of the locality. I desired to collect at a higher altitude on the following day, but felt it more important to spend my entire time in collecting the rhizomes and roots

of *Veratrum Eschscholtzii*. This species is very large and is apparently much more closely related to the European *V. album* than to *V. viride*. There can be little doubt that its medicinal properties will prove to be similar and equal with those of the other species, named above. It is exceedingly abundant throughout this entire region and medical supplies sufficient for the entire world could be here collected at a moderate price. Sufficient material for experimental purposes was obtained.

From Glacier I went direct to Seattle, where the United States Food and Drug Laboratory was visited, and where two days were spent at the Alaska-Yukon-Pacific Exposition. Here an attempt was made to procure from the managers of the Oregon State Exhibit donations of economic material, especially of cultivated fruits. At this exhibition I was impressed with the very great beauty of furniture made from the trunk of the Oregon laurel-tree (*Umbellularia californica*). Such furniture somewhat resembles that made from Honduras mahogany-wood but is even more beautiful. Trees of sufficient size for such use must be very old. It is said that the supply will last but a few years and it would seem that steps should be taken to provide for future supplies. At this place I obtained information as to the best region to visit for the study and collection of *Rhamnus Purshiana* or cascara sagrada, our most important indigenous drug. I had no opportunity for making collections before leaving for Portland, Ore., where again I had United States Laboratory duties to perform.

I remained there only long enough to perform those duties, although I made one excursion into the hills back of the city. The country here had recently been cut over, preparatory to burning, and I obtained but little. This included, however, specimens of *Rhus diversifolia*, in formaldehyde solution, for our poison collection, fine fruiting specimens of a wild cherry, and a blue elderberry.

From Portland, I proceeded to Toledo, Ore., near the mouth of the Yaquina River, and within a few miles of the Pacific coast, where a half day was spent in collecting what the region afforded. This included fine specimens of stems, rhizomes, and bulbous bases of the Tule-plant, *Scirpus occidentalis*. These stems consti-

tute one of the most important uncultivated textile materials in the world. In the higher Andes it is one of the principal materials used for thatching, and for the manufacture of ropes, sails, mattresses and the hulls of small boats. The same is true in some parts of the Old World. The swollen succulent bases of the stems are a rather important article of food among aborigines and settlers, wherever the plant grows. At this point I also collected two species of blackberry and a red elderberry, as well as the stems of *Chamaenerion latifolium*, the green pith of which is an article of food, especially in soups, of the northwestern Indians. On the following day I drove to the Indian reservation at Siletz, a distance of ten miles, through what is probably the most important primeval tract of heavy coniferous timber remaining in the United States. From the standpoint of economic material, this was certainly the most important collecting done upon the journey. The following articles were obtained, as formaldehyde specimens, for the economic museum: a scarlet-berried and a blue-berried *Vaccinium* (*V. parvifolium* and *V. ovalifolium*), both of strongly acid flavor; beautiful and abundant specimens of shallon-berry, a very important food-fruit of the Indians; roots and fruits of the Oregon grape-root; the salmonberry; a red and a black raspberry; a red gooseberry; a large blue currant, its foliage having a mephitic odor. The cascara sagrada tree was found in abundance and specimens, including fruiting branches and quills of bark four feet in length, were obtained. Probably the most important collection here made was that of the much celebrated, but up to the present time botanically unknown, "wild-licorice." This article has been discussed by all writers on ethnology and travel through those regions, from the earliest time. It has been assumed that it was the root of the native *Glycyrrhiza*, and, more recently, that of a species of *Lupinus*, but neither view has borne the test of investigation. I found it to be the rhizome of a species of *Polypodium*, which grows among the mosses on tree trunks. This rhizome is intensely and peculiarly sweet and it seems very possible that its sweet principle is something different from sugar.

Tule stems were forwarded by express to the Garden and all

the other articles were carried as hand-luggage to San Francisco, where they were shipped as freight.

On the way to San Francisco I was at a point in the mountains where the flora was extremely rich, and tried to collect there, but the train made no stop short of Hornbrook. I debarked here but found the country severely parched by drouth. There was very little to be secured, but I collected an interesting, very large-fruited wild red plum, a wild *Crataegus*, some cones of *Pinus ponderosa* and a cultivated crab-apple and plum, beside some miscellaneous species.

At San Francisco I had much Department work to do and I was able to spend only one day in the hills. Here it was excessively dry and little was obtained. I collected, however, an abundance of fruiting branches of the spurious cascara sagrada and the evergreen *Vaccinium*, in fine fruit. I also obtained specimens of the yerba santa (*Eriodictyon californicum*). At this point I visited the Muir Grove of *Sequoia sempervirens*, which I found exceedingly interesting.

The necessity of reaching Los Angeles in time for the convention prevented my visiting the Yosemite, and from making other stops en route. I did, however, find time to spend a few hours at the Big Tree station, Felton, Cal., where I collected bark of the false cascara sagrada.

At Los Angeles I was intensely occupied with convention work during the entire period of my stay and was not able to do any collecting. From here I shipped the collections made up to that point.

From Los Angeles I went by automobile to Redlands, a distance of sixty-five miles, through the San Bernardino Valley. Part of the valley is still a desert, so that I was able to note the changes that have been affected by irrigation in the reclaimed portion. So deeply impressed was I by this change that I decided to collect lantern-slides illustrative of the reclamation process and its results. About sixty such slides were obtained. These will illustrate my lecture to be given at the Garden on the afternoon of Saturday, November 6. They illustrate not only the changes referred to, but incidentally some important phases of

economic and ecologic botany. Part of them were selected from some hundreds of photographs to which I had access, while others were taken to order.

En route to Redlands, I stopped part of a day at Monrovia, where I found a very interesting and peculiar form of *Rhamnus*, which may easily prove distinct from *R. californica*, with which it is now collated. Here also I obtained museum material of a walnut and a small collection of general herbarium material.

During my stay at Redlands, I collected economic material industriously. The season for fruits was somewhat late and I made numerous long journeys in search of belated specimens of some things. Thus I obtained English walnuts, almonds, several varieties of plums, nectarines, two varieties of figs, two species of palm-fruits, a native grape, a native, edible opuntia fruit and a black mulberry. It was too early for cultivated grapes but I obtained a promise from a representative of the United States Bureau of Plant Industry that he would send us a representation of the varieties there grown, in the form of fruiting, leafy branches.

Two days were taken for a drive to Forest Home, a summer resort in the San Bernardino Mountains. Here I obtained a species of raspberry, a blue elderberry, another form of *Rhamnus*, and a small collection of pine-cones representing local species. I also obtained photographs of the trees yielding these cones, the lot representing an important addition to our forestry collection. I also secured here a number of species of acorns and a gooseberry. In returning down these mountains I met with an exceedingly narrow escape from an accident to the team and its occupants from a landslide, which passed within a few feet of the rear of the carriage. On the return trip I collected a good quantity of the yerba santa.

Before leaving Redlands, I had the very rare opportunity of seeing specimens of the two species of *Sequoia* growing side by side in irrigated soil and flourishing excellently and equally well, I am promised a photograph of this group.

On leaving Redlands, August 28, I proceeded directly to Williams, Ariz. It had been my intention to stop further west, but my itinerary was already exceeded. At Williams it stormed

severely on both days of my stay, but I collected steadily and secured large returns, probably more than one hundred species. This collection would doubtless have done well in spite of adverse conditions but for the fact that when I left I became separated from my driers. My collections had now become so heavy and bulky that I could not carry everything and I sent my driers on by express. The express company failed to forward them on the same train that carried me. Washouts then occurred and there was an interruption of train service for three days. Although my specimens suffered severely, I managed to save nearly all of them in presentable condition. My important object in stopping at Williams was to collect a species of *Berberis* and one of *Cimicifuga*, which I had seen in the mountains there in 1883. I found both localities but deforestation had destroyed the *Cimicifuga*. I collected the *Berberis* root and also the roots of a *Frasera* and of an interesting kind of angelica-root, having almost the exact odor and taste of the European drug. On this mountain I found the greatest abundance of a very large and delicious wild gooseberry with deep red spiny fruit (*G. pinetorum*). Fine museum specimens were obtained, as well as seeds for cultivation. In Johnson's Cañon, twelve miles west of Williams, I collected museum material represented by a species of grape, a walnut, and two cherries, besides the roots of a species of *Berberis*.

My next stop was at Adamana, Ariz., September 1, the special object being to visit the petrified forests of the region and to secure specimens of a number of wild food plants used by the Indians of that desert. I succeeded in the former attempt, obtaining a nice collection of petrified wood, but was disappointed in the second, as these products grew at too distant a point for me to visit. The only economic material here obtained was a species of *Grindelia* and an *Atriplex*. The region yielded only about fifty species of plants, as the weather was quite dry. Washouts in the mountains west, referred to above, delayed my departure for two days, after which I went on to Albuquerque, N. M. This time I was careful to take my driers with me, which proved a very useful precaution, since washouts again occurred, and there was no train for several days. At Albuquerque the country was very

dry, so that I could get but little herbarium or museum material. I sent home, however, several interesting living plants and obtained museum material of an edible *Opuntia* fruit, a *Grindelia* and a soap-root. I also purchased a fine specimen of piñon-nuts.

It had been understood before my departure that the Palo Amarillo Rubber Company would probably wish me to go to Mexico before my return. I was held five days at Albuquerque by telegrams relating to this matter and finally abandoned the idea and left for Trinidad, Col. An afternoon was spent at Wooton, near the Raton Tunnel, where I made a very interesting collection of about forty species. Among these were a fine *Crataegus* in fruit, a *Delphinium* and a *Grindelia*. Here I sought with special care a species of *Berberis* that I had known in the Burro Mountains, in the southwestern part of the territory, but it could not be found. I intended to search for it in another range on the following day, but it proved to be excessively stormy, the storm a very cold one and I was prevented from going out.

On Sunday evening I started for Denver, arriving there about Monday noon. The Arkansas bridge was carried away just after we crossed it so that I barely escaped another serious delay.

Here I planned a day's collecting at Bailey's, on the Leadville branch of the Colorado and Southern Railroad, and took a train at 6:30 P. M. Monday to return at 6 P. M. Tuesday. This proved a wild and successful trip from the start and was fittingly ended at about midnight by the engine and tender running into a sand-bank which had accumulated on the track and being thus thrown down the bank and overturned. A night of misery and a lost day followed, the locality affording almost nothing for collecting. Inasmuch as the car ahead of our passenger car was loaded with dynamite, I felt myself quite fortunate in escaping. Besides a few herbarium specimens collected at this point, I succeeded only in obtaining a museum specimen of *Rhus Rydbergii* for our poison collection. Upon returning to Denver I took the first train for New York.

I hope to determine the collections made before the close of the present year.

Respectfully submitted,

H. H. Rusby.

A DESIRABLE AUTUMN SHRUB.

Many years ago a shrub was introduced into cultivation from China, from whence it was sent by M. Eugene Simon. This plant is a member of the vervain family, to which belongs the well-known verbena of the gardens, and was given the name, in 1867, of *Clerodendron serotinum* by Carrière, who well describes it as a beautiful plant.

FIG. 32. *Clerodendron serotinum.*

Plants of this were secured by the Garden in 1899, and it is from a photograph of one of these that the accompanying illustration is made. Two of these plants may be seen in the Fruticetum in the neighborhood of the approach to the Woodlawn Road bridge, while others grace the nearby shrub border. As-

indicated by the illustration, the shrub is very bushy and produces its flowers in great profusion, its flowering period extending through September and into October. The leaves are large, dark green, and on slender stalks or petioles. It is unfortunate that Carrière in the cut which accompanies his description of this plant should have represented the leaves as sessile, for this has led to considerable confusion in the identification of the species. It is the flowers, however, of this plant, and the time of their appearance, which makes this shrub a valuable one from the standpoint of the horticulturist. These are borne in large corymb-like clusters which terminate the leafy branches, and offer a striking combination of deep old-rose and creamy-white, the angled calyx of the former color, while the creamy corolla spreads its divisions at the apex of a slender exserted tube.

This plant is well worth cultivating, for, in addition to its charming appearance, it sends forth its profusion of flowers at a time when most other shrubs are entirely wanting in bloom. In the latitude of New York, in the colder winters, it kills back considerably, but this need not be considered a drawback, for it quickly recovers. In a sheltered position this difficulty would perhaps entirely disappear.

This shrub is not generally offered in the nurseries, but can be secured at some of them. It is a near relative of *Clerodendron trichotomum*, a native of Japan, but is more desirable on account of the greater profusion of its flowers. Plants of that species may also be seen in the Fruticetum at the place referred to above, and the merits of the two species compared.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

The Garden received, in June, under the provisions of the will of the late William R. Sands, a Life Member, a legacy of ten thousand dollars, which has been credited to the Endowment Fund by direction of the Board of Managers.

Dr. Duncan S. Johnson, professor of botany in Johns Hopkins University, spent several days at the Garden during September

selecting duplicate specimens of living plants for the Botanical Garden of the Johns Hopkins University, situated in the western part of Homewood, Baltimore.

Miss Alexandrina Taylor and her mother returned from Jamaica, September 8, where they have been spending a year in residence at Cinchona for the purpose of collecting ferns, mosses and hepatics for study and distribution. Professor F. O. Bower, of the University of Glasgow, also spent several weeks at Cinchona during July and August, and Dr. and Mrs. Forrest Shreve, who have been in residence since June, expect to remain there until December; Dr. Shreve is a member of the Botanical Staff of the Carnegie Institution of Washington.

Miss Winifred J. Robinson, of Vassar College, has recently returned from the Hawaiian Islands, where she spent the summer collecting ferns. The larger islands were visited and extensive collections were made, special attention being paid to the tree-ferns. The work was aided by a grant from the Research Fund of the Garden, Miss Robinson having been here as a student for considerable periods.

A valuable collection of Boletaceae, consisting of seventy-five numbers, with complete descriptive notes made from fresh specimens, has recently been sent in for determination by Professor Bruce Fink, of Miami University, Oxford, Ohio. The collection includes about thirty species, several of which have not been reported before from that region. *C. auriflammeus* and *C. Curtisii* deserve special mention. Most of these specimens were collected by Professor Fink in August and September, 1909, at Big Hill, Ky., about five miles from Berea, in the edge of the Cumberland Mountains, at an elevation of 900 to 1,700 feet. The others were found in the vicinity of Oxford, Ohio. The Boletaceae are large fleshy fungi, which grow mostly on the ground in woods.

A copy of the Fourth Annual Report of the Forest Park Reservation Commission of New Jersey for the year ending October 31, 1908, was received here within the past few weeks. This periodical is probably one of the most complete and com-

prehensive publications on the subject to be obtained. Among the chapters of special interest to the general reader are those on :

The Planting and Care of Shade-Trees, by Alfred Gaskill, Forester.

Summary

Street Trees
Requirements
What to Plant
How to Plant
Care of Trees
What to do with Old Trees
Coöperation
Lawn Trees
Seashore Trees
Specific Descriptions

Insects Injurious to Shade-Trees, by John B. Smith, State Entomologist.

Summary

The Most Important Insects Infesting Shade-Trees and How to Treat Them

Fungi of Native Shade-Trees, by Byron D. Halstead, Botanist, New Jersey Agricultural College Experiment Station.

Summary

Fungi the Chief Cause of Disease in Trees.
How the More Important Trees are Affected.
Injuries Due to Soil and Other Conditions.
Methods of Spraying.
Fungicides.
The Care of Trees.

Meteorology for September. — The total precipitation recorded for the month was 2.20 inches. Maximum temperatures were recorded of 85.5° on the 4th, 86° on the 13th, 80.5° on the 23d, and 75° on the 30th. Also minimum temperatures were recorded of 46° on the 4th and 7th, 50° on the 13th, 49.5° on the 26th, and 41° on the 29th. Mean temperature for the month 63.5°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

10 specimens of boleti from Pisgah Forest, North Carolina. (By exchange with Dr. H. D. House.)

1 specimen of fungus from Formosa. (Given by Mr. W. H. Ballou.)

60 specimens of flowering plants from Florida. (Given by Dr. R. M. Harper.)

10 specimens of fleshy fungi from New Jersey. (By exchange with Mr. W. H. Ballou.)

2 specimens of *Salvia verticillata* from Pennsylvania. (Given by Prof. C. L. Gruber.)

1 specimen of *Corylus americana* from New Jersey. (Given by Mr. W. D. Kearfott.)

100 specimens of flowering plants from the West Indies. (By exchange with the Field Museum of Natural History.)

80 specimens of flowering plants from California. (By exchange with the University of California.)

1 specimen of *Ephelis mexicana* from Cuba. (Given by Mr. F. S. Earle.)

53 specimens of flowering plants from Ocean County, New Jersey. (Given by Mr. Percy Wilson.)

1 specimen of *Selaginella rupestris* from Long Island, New York. (Given by Mr. E. N. E. Kline.)

75 specimens of Boletaceae from Ohio and Kentucky. (Given by Prof. Bruce Fink.)

90 specimens of fleshy fungi from the Bronx. (Collected by Dr. W. A. Murrill.)

130 specimens of fungi from Chappaqua, New York. (Given by Mrs. C. E. Rider and Mrs. W. A. Murrill.)

1 specimen of *Trametes robiniophila* from Ohio. (By exchange with Mr. E. C. Volkert.)

2 specimens of *Inonotus amplectens* from Florida. (Given by Mr. C. H. Baker.)

22 specimens of fleshy fungi from New Jersey. (By exchange with Mr. W. H. Ballou.)

35 specimens of flowering plants and ferns from Connecticut. (Given by Mr. R. C. Benedict.)

2 specimens of flowering plants from Amagansett, New Jersey. (Given by Miss M. F. Eady.)

6 specimens of mosses from North America. (Given by Mr. George E. Nichols.)

1 specimen of fungus from Pennsylvania. (Given by Prof. D. R. Sumstine.)

30 specimens, "Ascomycetes," fascicle 44. (Distributed by Dr. Heinrich Rehm.)

27 specimens of fleshy fungi from Monmouth County, New Jersey. (By exchange with Mr. W. H. Ballou.)

3 specimens of fleshy fungi from Riverhead, New York. (Collected by Dr. J. H. Barnhart.)

1 specimen of *Steccherinum pulcherrimum* from New York City. (Given by Mr. W. H. Ballou.)

7 specimens of boleti from Pennsylvania. (By exchange with Prof. D. R. Sumstine.)

1 specimen of *Onygena equina* from New York. (Given by Prof. H. J. Banker.)

70 specimens of fleshy fungi from Chappaqua, New York. (Given by Mrs. W. A. Murrill.)

25 specimens of fleshy fungi from New York. (Given by Mr. E. C. Volkert.)

575 specimens of flowering plants and ferns from northern New Jersey and Pike County, Pennsylvania. (Collected by Mr. George V. Nash.)

408 specimens of flowering plants and ferns from Long Island and Westchester County, New York. (Collected by Mr. Norman Taylor.)

PLANTS AND SEEDS.

11 orchids from Costa Rica for conservatories. (By exchange with Mr. J. C. Zeledon.)

5 tree-ferns from New Zealand for conservatories. (By exchange with Missouri Botanical Garden.)

6 plants from New Mexico for conservatories. (Collected by Dr. H. H. Rusby.)

10 cuttings of *Rosa* sp. for nurseries. (Given by Miss Hilma Johnson.)

22 cacti for conservatories. (Purchased.)

1 orchid for conservatories. (By exchange with Mrs. B. B. Tuttle.)

4 plants for conservatories. (Given by Mr. Geraldyn Redmond.)

1 packet of seed of a gooseberry. (Given by Dr. H. H. Rusby.)

1 packet of seed from the mountains of Peru for conservatories. (Given by Mr. E. S. Miller.)

24 packets of seed from the Territory of Hawaii for conservatories. (By exchange with the Board of Forestry and Agriculture, Honolulu, Territory of Hawaii.)

8 plants derived from seed from various sources for conservatories.

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OF

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Journal of the New York Botanical Garden, monthly, illustrated, containing notes, and non-technical articles of general interest. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. [Not offered in exchange.] Now in its tenth volume.

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North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies and Central America. Planned to be completed in thirty volumes. Roy. 8vo. Each volume to consist of four or more parts. Subscription price $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Vol. 22, part 1, issued May 22, 1905. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae.

Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

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OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

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The New York Botanical Garden

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SOME PLANT DISEASES: THEIR CAUSE AND TREATMENT.*

Plants like animals are subject to disease, and the knowledge of the cause and treatment of these diseases is one of the branches of botanical work which has grown, until today it is a science in itself. This is, to a large extent, due to the fact that the government, through its Agricultural Colleges, is appropriating annually large sums of money to be expended in the investigations of the cause and treatment of the diseases of the cultivated plants; and well it may afford to do so, for to be able to combat successfully a single plant disease would bring in return to the country in a single year much more than all that is spent for this purpose during the same length of time.

Almost every plant which grows has its characteristic disease and some plants are afflicted with many, so that the subject is a very extensive one and I can do nothing more this afternoon than to call your attention to a few of the most common plant diseases, give you some idea of their causes, and a few of the methods which have been employed for their treatment.

Before taking up the subject of plant diseases proper, I want to mention briefly, by way of comparison, one of the chief causes of animal diseases. As you all doubtless know, many of the diseases of the animal body, speaking more particularly of the

* An illustrated lecture delivered in the Museum building of the New York Botanical Garden, October 30, 1909.

human body, are caused by minute organisms which live, many of them move, grow, and reproduce within the tissues of our bodies. These organisms are known in a general way as bacteria.

The bacteria are the smallest known living organisms and can be studied only with the aid of a powerful microscope, and for this

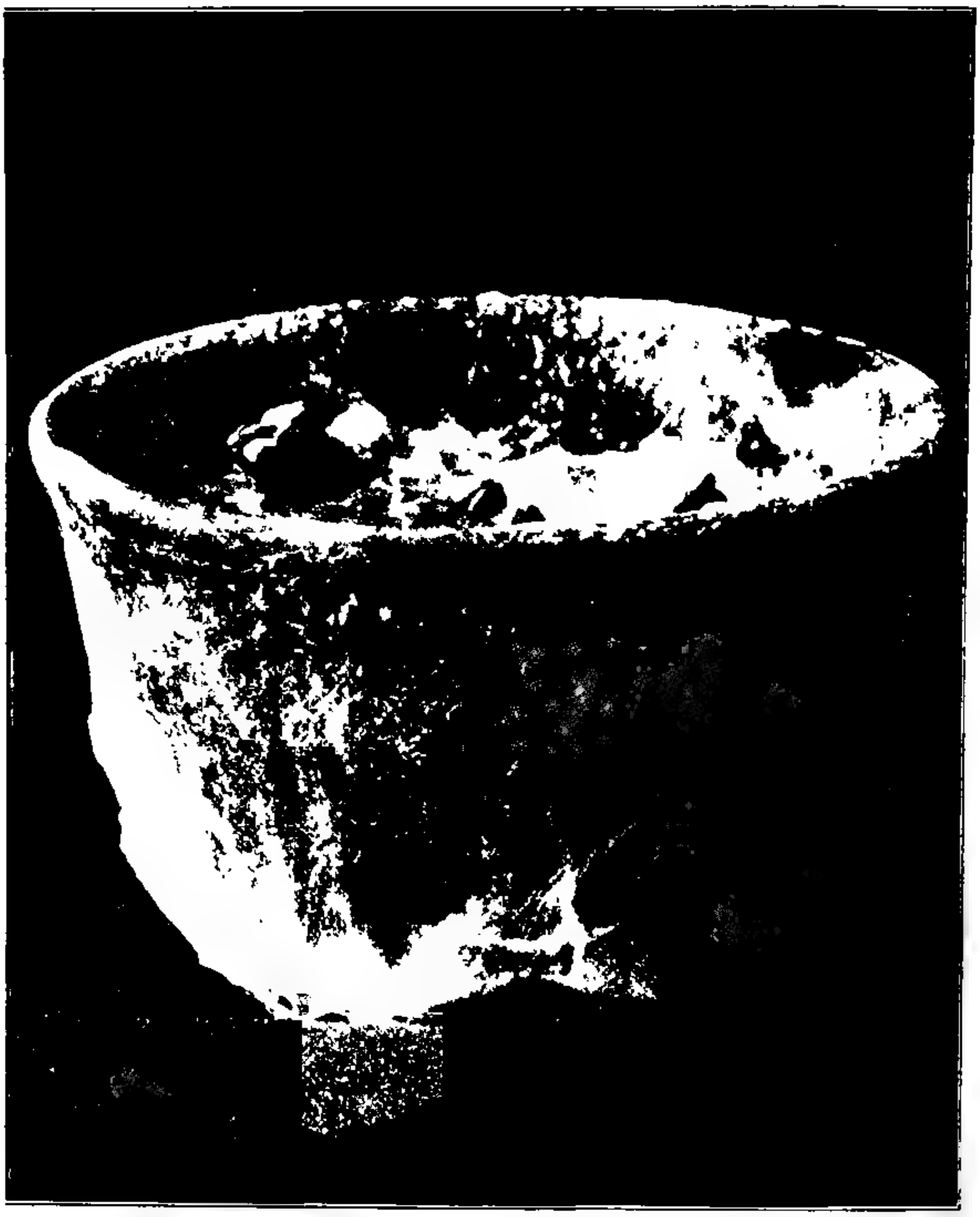


FIG. 33. The mycelium or growing phase of a fungus.

reason the science of bacteriology is of comparatively recent origin. The reproduction of the bacteria is a very simple process: an individual attains mature size and divides or breaks into two; each of the offspring again attains mature size and the process is repeated. One of the chief characteristics of the bacteria is their physiology,

or the way in which they live. Every plant which has green coloring matter (chlorophyll) is able to make its food from the simple materials which are present in the air and in the water of the soil. Those living organisms which are destitute of green coloring matter are unable to make their own food and are therefore dependent upon other organisms for their food supply. The

FIG. 34. The fruit of a fungus on an oak stump.

bacteria belong to this latter class and there are two ways in which they may obtain their nourishment: (1) They may prey upon other living animals or plants when they are said to be parasites or (2) they may live upon decaying matter when they are known as saprophytes.

The fact that many diseases of the human body are known to be caused by bacteria is likely to give to this group of plants (for plants they are) a reputation which they do not rightfully deserve, for these organisms are really of great service to the world. In the commercial world they are made use of in many ways: the process of fermentation and the manufacture of alcohol is dependent upon the action of bacteria; in the cheese industry they play an important part, and are employed in the manufacture of many dyes. Perhaps one of the chief services of the bacteria is in their relation to decay. The process of decay is a very important one, and were it not for the action of bacteria in reducing complex materials to their simple form the surface of the earth would become encumbered with the remains of dead animals and plants. In this alone, they atone for any evil which may be charged to them. The fact that a few forms have become parasitic upon the human body, bringing about disease and death, is of vast importance to us, but so far as this group of plants is concerned it is only an incidental matter, for there are comparatively few which act in this manner.

There is another group of lower plants which is of vast importance to us on account of their relation to animal and plant diseases, more especially to plant diseases. These plants are known as fungi, mildews or moulds. The fungi bear about the same relation to plant diseases which bacteria hold to diseases of animals. While many diseases of the animal body are caused by bacteria, comparatively few are caused by fungi. On the other hand, while many diseases among the vegetable kingdom result from fungi, comparatively few. are known to be caused by bacteria. The fungi may be considered one of the chief causes of plant diseases.

From a physiological point of view the fungi are identical with bacteria; *i. e.*, they are devoid of green coloring matter and are therefore dependent upon other organisms for their food, and like bacteria they may be either parasitic or saprophytic. The chief differences between fungi and bacteria are in their structure and reproduction. Instead of isolated, minute, motile bodies the fungi consist of a mass of delicate, simple or branching threads.

These threads are many times more delicate than the finest hair, in fact, they are so delicate that they can scarcely be seen with the unaided eye. However, when they occur in large numbers these threads give somewhat the appearance of very delicate cotton. Such a mass is known as the mycelium (fig. 33) or growing phase of the fungus.

The fungi are propagated by means of special reproductive bodies known as spores. The spores may be very simple bodies, and among the lower forms are often borne in chains—like strings of beads, or they may be more complicated and there is no limit to the variety of forms which may be assumed by the reproductive bodies of this group of plants. Among the higher fungi special structures are developed for holding the spores. Such structures as toadstools, puffballs, and bracket-fungi (fig. 34) represent only the spore-bearing phase of fungi whose mycelium or growing phase may extend often for many feet into the substratum on which they are borne.

Saprophytes Which May Become Parasites.

The blue mould is a fungus with which we are all familiar, and one which occurs normally as a saprophyte on decaying materials of various kinds, especially on decaying fruit. Often, on removing the cover from a can of preserved fruit, a bluish scum will be found over its surface. This is the blue mould, and the spores of this fungus are produced in such great abundance that it is impossible to expose suitable materials to the air for any length of time without having them infected with this plant. While normally a saprophyte, this fungus may under proper conditions become a parasite, and is often the cause of great damage to ripe fruit, especially to fruit which is kept in storage. This fungus, however, is unable to attack fruit unless it is injured in some way and experiment has proved that if stored fruit is carefully handled so as to prevent bruising the damage from this cause is very much reduced.

The fish mould is another fungus which normally lives as a saprophyte on decaying materials in water. It is doubtful if this plant is able to attack healthy fish, but if the bodies of these

animals are injured or the scales broken the fungus enters the wound and has been known to destroy thousands of fish in a single season. This is one of the comparatively few cases of diseases of the animal body which are caused by fungi. We have some examples even among man, ringworm representing such a disease.

Harmful Parasites.

Indian Corn and Its Diseases.

I want now to call your attention to some of the diseases of the cultivated plants which are caused by fungi. The Indian corn is strictly an American crop and is, without exception, the chief of crops in this country at the present time. Corn is made use of in two ways: (1) As an animal food and (2) as a human food direct. Its use as a human food is of minor importance, since it is found more profitable to use this grain as a live stock food. In this way it is converted into beef and pork which is sent to our cities and more congested centers of population to be used as a food product. Anything which tends to reduce the corn-crop affects the price of meat, and we are all influenced by it whether we are interested directly in the cultivation of corn or not.

Like most other cultivated plants the corn-plant is subject to many diseases. The one which is of especial importance is that known as the corn-smut. Corn-smut first becomes visible as large puffball-like outgrowths which replace the healthy grains. This however represents only the fruit of the fungus. In the fall of the year these bodies which are known as smut-balls burst and the soot-like spores within fall to the ground in showers. There they lie until spring, when they germinate and produce a tiny thread. If perchance this comes into contact with a young corn-plant it penetrates its tissues and there grows for a time unseen. In the late summer when the corn-plant begins to send up large quantities of food to be stored in the seed for the nourishment of the young corn-plant, the fungus avails itself of this favorable opportunity and uses this food on which to mature its

own spores, and we find a smut-ball where we should have had a healthy grain.

Since the corn-plant is infected mainly through the soil one of the best methods of controlling this disease is to prevent the infection of the young plants which is best accomplished by the rotation of corn with other crops. If corn is grown year after year on the same soil the disease becomes worse and worse until a very large part of the crop is destroyed.

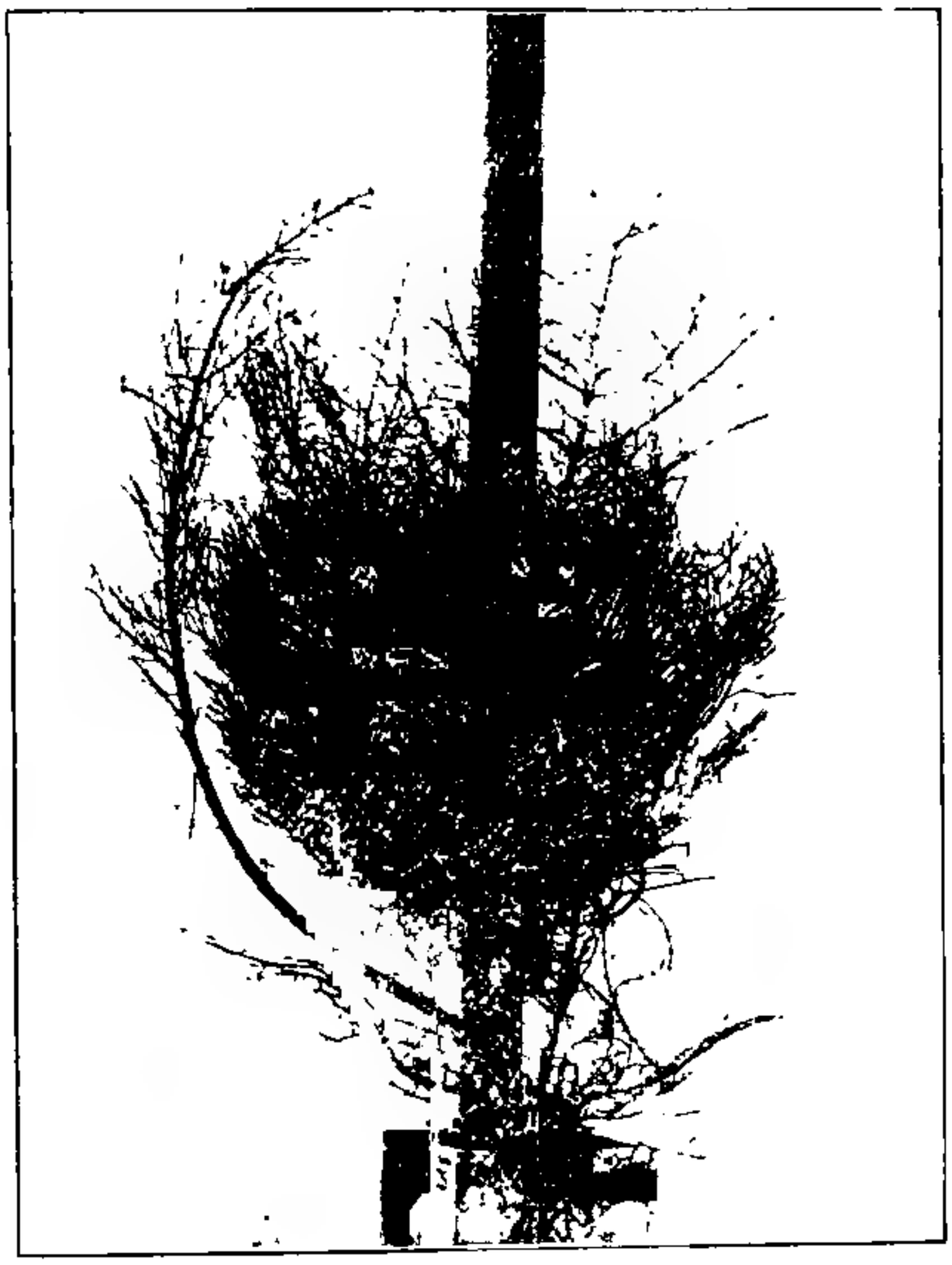


FIG. 35. Witches' broom of black spruce, a disease caused by a fungous parasite.

SMUT OF OATS.

Another crop of considerable importance in this country is the oat-crop. If we should walk through a field of oats about harvest time and look closely at the grain we would find occasionally a head in which all of the healthy seeds are replaced by a black mass of spores similar to those found in the corn-smut. At first sight it might appear that the loss from this disease is too

slight to deserve attention. When we consider that it takes as much nourishment to mature a head of smutted oats as one of healthy grain, and that this disease causes an annual loss in the United States estimated at $15,000,000, we begin to realize its economic importance. The life history of the oat-smut is very similar to that of the corn, but its methods of infection are quite different. The spores are not produced in such great quantities and the chances of the young plants becoming infected by the spores in the soil are comparatively slight. In thrashing the grain the spores of the smut are thoroughly distributed among the healthy seeds and, being very small, readily cling to the husks which surround the seed of the oat. If these seeds are planted, the seed of the host and the spores of the fungus germinate together and, being in close contact, the young plant is easily infected.

The greater part of the loss occasioned by oat-smut is unnecessary for this is one of the diseases which is very easily controlled. It has been found that it is possible to treat the seed of oats with formaldehyde or hot water in such a way as to destroy the spores of the fungus which may cling to the seed without injuring the life of the seed itself, and since the main source of infection of this disease is through the seed this means of control has proved very effective.

Wilt Disease of Watermelon and Cotton.

In places where the watermelon is cultivated extensively much trouble has resulted from a disease commonly known as the watermelon-wilt. This disease is characterized by the wilting of the foliage which results in the death of the plants. In the watermelon as in other higher plants the water necessary to supply the forming fruit and the growing leaves as well as that lost by evaporation through the leaves is taken up from the soil and conducted through the stems to the place where it is to be used or evaporated. If we examine a section of the stem of a watermelon vine we find numerous large ducts which serve this purpose. Those who have made a study of the watermelon-wilt disease have found that this is caused by a fungus which grows

on the inside of the stems in such a way that the mycelium of the fungus clogs up the water ducts and shuts off the water-supply which results in the wilting of the leaves and death of the plants.

The cotton-plant should also be mentioned in this connection, since this plant is attacked by a wilt disease similar in its effects to that of the watermelon. And strange to say, this disease is caused by a variety of the same fungus which attacks the watermelon.

The best solution of the wilt problem seems to be in the cultivation of resistant varieties of the plants affected. This may be done by the selection of natural strains of varieties, by the production of hybrids, or by the selection of the seed from the stronger plants of any variety. Much progress has been made in the cultivation of resistant varieties of cotton.

Rust of Wheat and Other Plants.

It is not necessary to mention the importance of wheat as a food product. This grain thrives best in rather cool climates. In portions of the northern United States and Canada wheat growing is one of the principal industries. As harvest time approaches in districts where wheat is relied upon as one of the chief farm products the condition of the grain with reference to wheat-rust is watched with the greatest of solicitude, for this disease has been known to destroy the entire crop.

Wheat-rust is a very old offender and has been known since ancient times. The ancients were very superstitious and believed that this disease was caused by evil spirits and the remedy proposed by them was to frighten away the evil spirits by making a loud noise. The cause of wheat-rust is very well known at the present time, but the remedy proposed by the ancients is probably about as effective as anything which has been suggested in more recent times.

This disease is caused by a fungous parasite and one of the most perfect parasites with which we have to deal, and at the same time one of the most difficult to control. Three distinct stages are represented in the life history of this fungus, the spring phase, the summer phase, and the autumnal or winter phase.

The spring phase occurs on the leaves of the barberry bush, a shrub which is cultivated for hedges. The summer and winter phases occur on the leaves and stems of wheat or other grain.

If we examine the leaves of the barberry bush in the spring of the year we will find that they are covered with minute pockets, each of which is filled with a mass of golden-yellow spores. These spores are blown about by the wind, and if they fall on the leaves or stems of the wheat-plant and weather conditions are suitable they germinate and in a short time we have produced there a mass of rust-red spores which represent the summer phase of this fungus. These spores are again blown about and germinate immediately producing other infection. Late in the summer we find, in place of the red spores, a mass of black spores, which represents the autumnal phase of the rust and is commonly known as the black rust. The black rust represents only a more advanced stage of the red rust. The black spores are especially adapted to tide over the unfavorable conditions of the winter season. They live over winter on the old straw or in the ground. In the spring of the year each germinates and produces a number of minute spore-like bodies which are ready to return to the barberry bush and begin the life cycle of this fungus anew.

Since the barberry bush plays an important part in the life history of this disease one precaution which can be taken is to destroy these bushes which may occur in fence rows in close proximity to wheat fields. One of the most hopeful means of eventually controlling this disease is in the cultivation of rust-resistant varieties of wheat by a process of seed selection and it remains to be seen what the outcome of this line of attack will be.

Many different plants are attacked by rusts of various kinds. The cedar-apple rust is one of considerable importance. While very different in general appearance the cedar-apple rust is closely related to the wheat-rust. This disease is represented by two stages which occur on the cedar-tree and on the leaves of the crab-apple respectively. The cedar-apple stage is characterized by gall-like swellings often an inch in diameter and the trees are often heavily loaded with these apple-like growths (fig. 36). People have been known to plant cedar-apples with the hope of producing

cedar-trees, but they have no more relation to the cedar than an insect-gall has to the plant on which it is produced. To control this disease the planting of cedar-trees and apples near together should be avoided.

FIG. 36. Gall-like growth of cedar-apple rust.

"There is no loss without some gain," and while the rusts attack many cultivated plants, bringing about immense losses, they also attack plants which are troublesome weeds in many places and doubtless assist to some extent in holding these weeds in check.

THE POTATO AND ITS DISEASES.

The potato represents one of our staple foods and there is probably no plant which is more susceptible to diseases of various

kinds than this one. The first of these diseases which I will mention is that commonly known as scab. The name is well chosen for the disease is characterized by the rough, scaly appearance of the tubers. This diseased condition results from the presence of a parasitic fungus.

The potato is not propagated by means of seed but by the tubers themselves. If diseased potatoes are planted the resulting crop is sure to be infected. Potato-scab is transmitted through the tubers which are used for propagation but may also be transmitted through the soil. The selection and treatment with formaldehyde of the tubers to be used for planting has been shown to be quite effective in controlling this disease.

One of the most destructive diseases of the potato is the early blight which makes its appearance as small, white fungous growths on the leaves, often destroying a whole crop before its presence has been detected. In places where the potato is largely relied upon as an article of food, famine has been known to follow the destruction of this disease. The blight not only causes death of the plants but brings about rotting of the tubers as well.

Spraying with proper fungicides* has been found effective in the control of this disease if taken in time. From a series of experiments in New York state spraying has been found to result in a saving of more than twenty dollars per acre. If these experiments were extended throughout the state with equal results the saving would amount to $8,000,000 after deducting cost of spraying.

Diseases of the Orange.

The sooty-mould is a fungus which injures the orange to such an extent that the losses from this disease in Florida are estimated at $50,000 annually. This trouble is a combination of an insect and a fungus. The insect attacks the orange and the fungus appears on the remains of the insect, and together these pests have succeeded in disfiguring the orange to such an extent that its market value is greatly reduced.

* Bordeaux mixture, a solution of lime and copper sulphate, is one of the best known fungicides. This is sprayed over the foliage of the plants and serves as a preventative against the attacks of fungi.

There are numerous fungi which occur as parasites on scales and other insects. The destruction of the fungus only lends encouragement to the insects on which they occur. If the insects are destroyed both will disappear, since the fungus cannot live on the plant tissues. At the present time many experiments are being conducted especially in Florida with a view to using such fungi for combating the insect pests. This method of the employment of the natural enemies to combat plant diseases has, up to the present time, given remarkable results and much more is hoped for it in the future.

Ergot of Rye.

The ergot of rye is a fungous disease which has several economic bearings. The ergot which replaces the healthy grain consists of a very hard slender body about one-half inch in length and represents the resting stage of a fungus. This fungous body is poisonous and when eaten by cattle causes a characteristic disease known as ergotism. When present in rye flour in sufficient quantities it causes trouble among people; it also causes a slight reduction of crop. These fungous structures are gathered and, having medicinal properties, are sold as an official drug under the name of ergot.

Diseases of Peaches, Plums and Cherries.

The leaf-curl is one of the most common diseases of the peach. As a result of this disease the leaves become curled, distorted and twisted. They finally become discolored and fall. The plum-pocket is caused by a fungus similar to that of leaf-curl. Plum-pocket causes the fruit to become much enlarged, hollow and deformed, the outside of the pocket being entirely covered with the fruit of the fungus. Witches' brooms are sometimes caused by a similar parasite (fig. 35). The black-knot is another disease of fungous origin which attacks both plums and cherries, causing the branches to become enlarged, deformed and blackened by the fruit of the fungus.

Leaf-curl can be controlled by spraying with proper fungicides

about the time the buds are opening in the spring. Plum-pocket and black-knot are both best controlled by pruning back the diseased branches. If the tree is badly infected with black-knot the whole plant should be cut down and burned.

Insect-Galls.

Insect-galls include those injuries by insects which result in abnormal swellings of the stems or leaves or other parts of the plant (fig. 37). The adult insect deposits its eggs in the young parts of plants, and the sting of the adult or the hatching of the young or both together furnish the stimulus necessary to bring about this abnormal and often very conspicuous growth. From their general appearance insect-galls are likely to be confused with fungous diseases. Since these injuries are of insect origin their consideration belongs more properly to the entomologist.

Parasites which are Beneficial to the Host.

We ordinarily think of a parasite as something which is harmful to the host on which it occurs. This is usually the case, but there are some parasites which are not harmful, and on the other hand are actually beneficial to the plants on which they live. We have an interesting example of this among the various members of the pea family. If we should remove a pea-vine or bean-plant from the ground we would find the roots often covered with numerous swellings resembling miniature potatoes. These swellings are caused by a parasite which in this case is one of the bacteria.

Plants need nitrogen in order that they may grow. While nitrogen is present in great quantities in the air most plants are unable to use it in this form but require it in the form of compounds as it exists in the soil. The nitrogen compounds in the soil become very much reduced by excessive cultivation, so that it is often impossible to produce a healthy crop, and soils are then said to be worn out. The bacteria which grow on the roots of various members of the pea family are able to fix free nitrogen from the air in such a way as to make it available for the host

on which they grow. For this reason the members of this family are able to thrive on soils which are unsuitable for other plants. Not only do these bacteria supply the nitrogen compounds necessary for the host on which they grow but the soil is enriched by the growth of such plants.

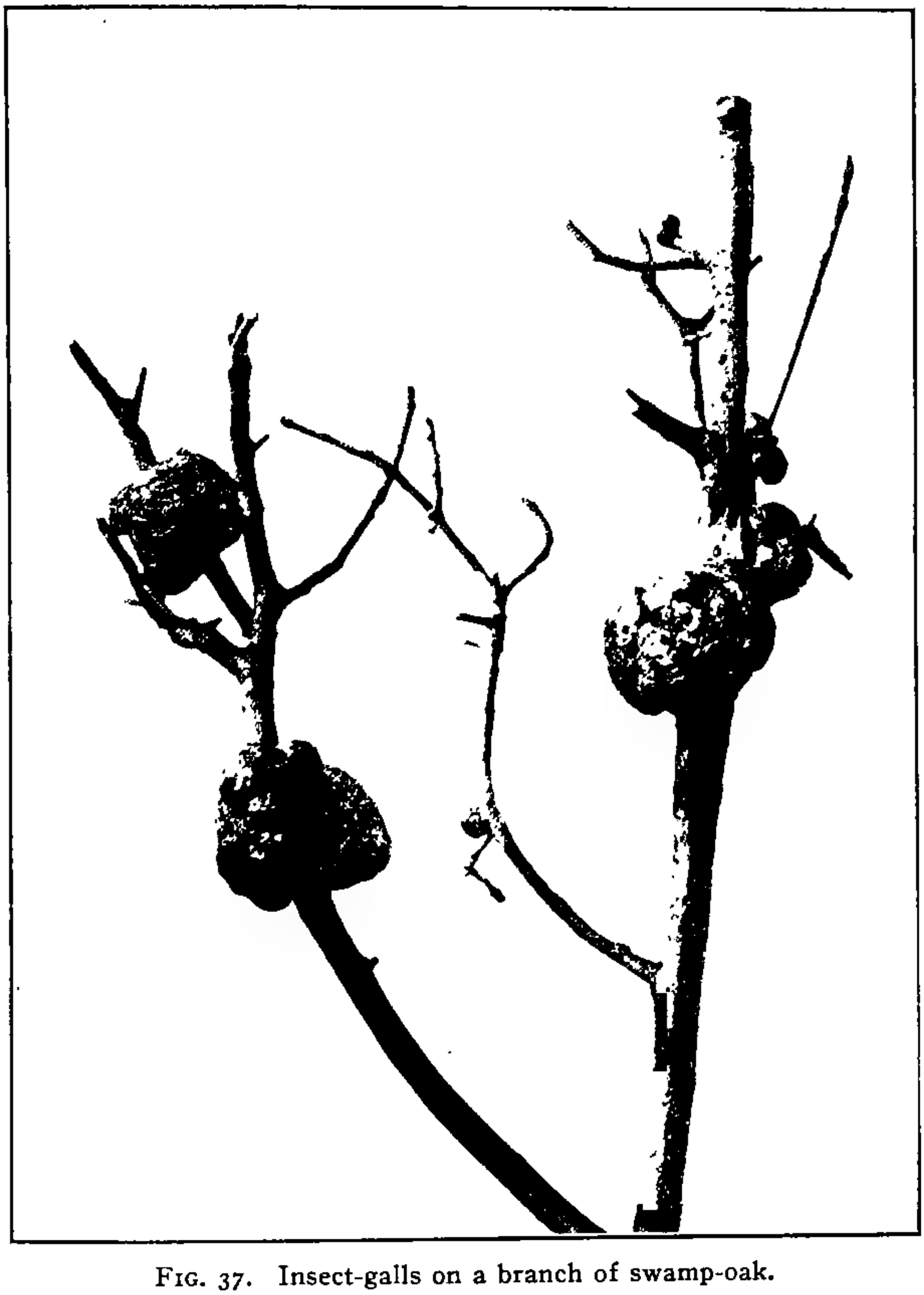


FIG. 37. Insect-galls on a branch of swamp-oak.

The value of clover as a fertilizer has long been known but it is only comparatively recently that the reasons for this have been worked out, and the value of such plants as rotation crops is fully recognized at the present time.

Parasites Among Higher Plants.

Not only do the lower plants become parasitic upon the higher plants, but some of the higher plants have also adapted themselves to living as parasites. One of the most common illustrations of such a plant is the dodder. This is produced from a seed, but when the young plant has attained a height of about an inch it attaches itself to the stems of other plants, sends minute sucking organs into the stem of its host and throughout the remainder of its life draws its nourishment from this source. Cultivated plants are often attacked by this parasite but as the cause is evident the dodder is controlled in the same manner as other troublesome weeds.

Fred J. Seaver.

THE TROPICAL FERN COLLECTION.

During the past summer the large collection of tropical ferns, and selaginellas and related plants, formerly located in houses nos. 10 and 11 of conservatory range no. 1, were transferred to the new conservatories, known as range no. 2, located on the east side of the grounds, in the midst of the tract devoted to the deciduous arboretum. It now occupies the entire completed portion of the new conservatories, with the exception of the east house of the transverse range, containing the cycads, which were described in the previous number of this Journal. The tree-ferns and the larger specimens of the other kinds of ferns will be found in the west and middle transverse houses, while in the low house, running north and south, is located the remainder of the collection, consisting of the greater number of genera and species; these are arranged in botanical sequence, the details of which are described below.

Entering the range by the west door, we pass through the vestibule, provided to guard the plants in cold weather from too sudden changes of temperature, into the westerly house. As seen from the door, the view presented is that shown in the accompanying illustration. From here one obtains a good idea

West tree-fern house, Conservatory Range no. 4, as viewed from the vestibule. The tall plant in the center is *Cyathea arborea*; the one to the right is *Cibotium Barometz*, the lamb-fern or Scythian lamb.

of these tree-like members of a tropical vegetation. The plant towering above all the others is the tall tree-fern, *Cyathea arborea,* a native of the West Indies. This is typical of the great mass of tropical tree-ferns. To the right, in the corner of the center bed, is a fine specimen of the lamb-fern, *Cibotium Barometz,* known also as the Scythian lamb. This is found all the way from southern China to the East Indies. In olden times it gave rise to a marvelous tale told by travelers, to the effect that there existed in the vast region to the north of the Black Sea, known at that time as Scythia, a creature half animal and half plant, having the appearance of a lamb, its skin covered with soft down. This creature, so the story ran, was attached to a stalk in such a way that it could turn in all directions; after exhausting all of the vegetation within reach it pined away and died. It was the stout hairy rootstock, which may be seen on the specimen here, which gave rise to this fantastic tale, but it takes a strong imagination to see the resemblance. Another member of this genus, to be found further along in the house, is *Cibotium Schiedei,* a native of Mexico. Other tree-ferns here are *Cyathea Tussacii,* found in Jamaica; *Cyathea insignis,* from Jamaica and eastern Cuba; and *Alsophila aspera,* widely distributed in the West Indies, and known as the rough tree-fern, from its very rough leaf-stalks. Many of the tree-ferns in this house, as well as in the next, were secured by expeditions sent out by the Garden. Some of these cannot be purchased, and the only way to secure them and many other desirable plants other than ferns is by means of these expeditions.

On the western wall are two handsome members of the climbing ferns, belonging to the genus *Lygodium,* to which our native plant, *Lygodium palmatum,* known often as the Hartford fern, belongs. These are *Lygodium japonicum,* the Japanese climbing fern, distributed from Japan to China and southern Asia and in tropical Australia, and *Lygodium circinatum,* from tropical Asia and Queensland. These are both excellent plants for covering a wall of this kind.

In the beds on either side will be found other ferns. Among these are the forked sword-fern, *Nephrolepis biserrata furcans,*

a horticultural form of the species which is widely distributed in tropical regions; the showy *Blechnum brasiliense,* with its plume-like fronds arising from a short erect stalk; Wittbold's sword-fern; a fine large plant of that inhabitant of the Old World tropics, the bird's-nest fern, *Neottopteris Nidus;* and an attractive plant of *Selaginella Wallichii,* from India. Over the walk in this and the next house are many ferns used as basket-plants, a use which they serve admirably. The Fiji Island, the cut-leaved, and the five-leaved davallias are among these, the first from the Fiji Islands, as its name indicates, the last from Malaysia and Polynesia, while the remaining one is from Java. On the eastern wall separating this house from the next will be found a vigorously growing plant of *Monstera deliciosa,* not a fern but a member of the aroid family, to which belong our common jack-in-the-pulpit and the skunk's cabbage. The fruit of this plant is edible, the flavor reminding one much of the pine-apple. A number of other plants of the aroid family will be found in the adjoining house climbing on the walls.

Passing to the next house, the middle one of this transverse range, we again find the large tree-ferns occupying the center as the most conspicuous objects. Species not referred to when describing the first house are *Alsophila armata,* the armed tree-fern, a native of tropical America; *Hemitelia grandifolia,* a native of tropical America; and *Cibotium regale,* found wild in Mexico. There are still other species to be seen which cannot be enumerated here. Also in this house will be found a number of species of the Marattia family, the Marattiaceae, in the genera *Angiopteris* and *Marattia.* These ferns are peculiar in having thick scale-like bodies, sometimes regarded as stipules, at the base of the fronds, a feature most unusual among the ferns. The leaves are large and decompound and of a rich green. They are found widely distributed throughout tropical regions, in both the Old World and the New.

A large swamp fern will also be found here, a native of Florida and tropical America. It is *Acrostichum aureum,* its tall fronds forming attractive masses of vegetation in swamps and other wet places in the country where it grows. It is common in the south-

Central tree fern house, Conservatory Range no. 2, the north walk. The plants over the walk are various species of the stag horn ferns

ern parts of Florida, from whence the plants here exhibited were obtained. Other interesting ferns to be found in the center bed are, among others, the golden polypody, *Phlebodium aureum,* found extensively in Florida and throughout tropical America, and its close relative, *Phlebodium sporodocarpum,* with gray-green fronds, also a native of tropical America; Foster's sword-fern, a horticultural derivative from *Nephrolepis exaltata;* and *Drynaria conjuncta,* an odd fern from northern India. Over the walks will be found a great many ferns suspended from the roof. The most striking of these are the stag-horn ferns, which will be found over the north walk. The resemblance of the fronds of some of these to the stag's horns is very striking, and is ample reason for the adoption of the common name applied to them. Many other interesting ferns will be found in this house, and a careful study of the collection will well repay any visitor.

Passing through a door on the south side of the house we have just been inspecting brings us into the low north and south house where the greater number of genera and species are to be found. Here we do not get the dignity of the large tree-ferns, but there are many very attractive and dainty specimens to be seen. As stated above, the plants in this house are arranged in botanical sequence, thus bringing closely related forms in juxtaposition. This sequence begins to the right, as one enters from the tree-fern houses, and continues along the right-hand bench to the other end of the house, where it crosses the walk, returning down the center bench on both sides. At the point of entrance to the house the sequence is again taken up on the east bench, continuing along this to its termination at the farther end.

It is impossible to call attention here specifically to the great number of kinds to be found in this collection. Beginning the sequence is the collection of selaginellas which are not true ferns. Many of the selaginellas are exceedingly beautiful. They are quite diverse in form, from the little creeping ones, barely an inch high, to those with long stems sometimes a foot or more tall. Following is the Psilotum family, represented here by a small plant with slender stems and branches. A few small plants of the Marattia family are placed here to

show their position in the sequence; large plants may be found in the middle tree-fern house. Next in order come the royal fern, the floating-fern, and the tree-fern families, the last in small specimens merely to show their relationship to the others. About half way down the house the Polypodiaceae, or Polypody family, begins. To this belongs the greater part of the ferns, and especially those of our own vicinity. This family embraces many genera, and only the more prominent ones can be mentioned here. The stag-horn ferns are represented by a few specimens, and the acrostichoid plants by the genera *Acrostichum, Elaphoglossum* and *Hymenodium,* among others. *Vittaria lineata* is here in a plant or two; this is sometimes known in Florida as the old man's beard, from its habit of forming a fringe of vegetation at the base of the leafy crown of the palmetto palm. The polypodies, ferns in which the spore-cases are without an indusium or covering and are borne in usually round masses, are represented in such genera as *Polypodium, Goniophlebium, Phlebodium, Campyloneurum, Phymatodes, Pessopteris, Selliguea* and *Cyclophorus,* the last genus occupying the farther end of the side bench.

Crossing the walk, the sequence is again taken up with the pteroid ferns, those in which the spore-cases are covered by an indusium formed by the reflexed margin of the frond. This group includes such genera as *Pellaea,* the cliff-brake, *Doryopteris,* a large collection of maiden-hair ferns, *Adiantum, Pteris,* and the silver and gold ferns, both belonging to the genus *Ceropteris.* Following these are the asplenioid ferns, with the spore-cases arranged in linear or narrow, straight or curved, masses, covered with an indusium. In this are included such genera as *Diplazium, Callipteris, Asplenium, Blechnum, Lomaria* and *Woodwardia.* Following these, at about the middle of the house, begin the shield-fern forms, in which the spore-cases are arranged in round masses, in some very small, in others quite large, and usually covered with a shield-shaped indusium. Here we find *Dryopteris,* the shield-ferns, *Phegopteris, Tectaria, Polystichum,* to which belongs our common Christmas fern, *Olfersia,* and *Anapausia.* Succeeding these on the east bench are the davallioid ferns, rep-

resented by many specimens of the sword-fern, *Nephrolepis, Davallia,* many forms of which make desirable basket-plants, *Microlepia, Odontosoria* and *Dennstaedtia,* these terminating the sequence. Among the sword-ferns here will be found several horticultural derivatives from the common *Nephrolepis exaltata,* widely distributed in tropical America. These plants form an interesting study in variation induced largely by cultivation.

There are many genera and species represented in this collection, and the arrangement in botanical sequence permits of a comparative study of them, a method by which the differences and resemblances can best be studied, and thus an intimate knowledge of their classification obtained.

GEORGE V. NASH.

THE FLOWERS AND FRUIT OF THE TURTLE-GRASS.

One of the most interesting plants recently collected by Mr. Percy Wilson, administrative assistant at the New York Botanical Garden, on his trip to the Bahamas, was the turtle-grass, *Thalassia testudinum,* in flowers and young fruit. The plant was first discovered by Patrick Browne and described by him in 1756 in his Civil and Natural History of Jamaica under the name "The small grassy leaf'd Alga, or Turtle-grass." He adds: "This plant grows frequently in the shallow sandy bays of Jamaica; and is the most common food of the manatee, the turtle, and the trunc-fish; as well as many other smaller marine animals." It was also described by Sloane in his Natural History of Jamaica, but there confused with an alga described and figured by L'Obel and Caspar Bauhin.

The first description of it as a flowering plant we find in Konig & Sims' Annals of Botany in 1806, under the name of *Thalassia testudinum.* Konig had found specimens of this plant in Banks' herbarium under Solander's manuscript name *Thalassia,* which he adopted. Konig described, however, only the staminate (male) flowers. As far as the writer can find, there has never been published any description of the pistillate (female) flowers

and of the fruit of *T. testudinum* until recently in the North American Flora, vol. 17, p. 73. Wherever the pistillate flowers or the fruit of *Thalassia* have been described, these descriptions have always, as far as could be ascertained, been drawn from the only other species of the genus, *T. Hemprichii* of the Indian and Pacific Oceans. As *T. testudinum* is the type of the genus *Thalassia,* and *T. Hemprichii* was originally described under another generic name *Schizotheca,* it has been doubtful if these two species belonged to the same genus. The material collected by Mr. Wilson has enabled us to settle this point.

The fruit is covered with very numerous finger-like processes characteristic of *T. Hemprichii,* the only difference being that it is ellipsoid instead of globular. The writer intended to make a more careful investigation of the morphological structure of the fruit, but the dry material, more or less crushed and distorted by pressing, could not be restored to its original condition and the sections made were as a whole unsatisfactory. One fact was ascertained, however, viz., that the fruit is but imperfectly 9–12-celled, the partitions not quite meeting at the center. In most members of the Frog's-bit Family, the fruit is completely several-celled.

The turtle-grass is a perennial with a horizontal rootstock creeping in the sand or mud. The erect stems are very short, at the base covered with fibers and bleached sheaths, remnants of old leaves. The leaves are linear, somewhat fleshy, 6–12 mm. (¼–½ inch) wide. In the flowering specimens collected by Mr. Wilson, they are only 5–15 cm. (2–6 inches) long, but in sterile material (ours is mostly collected in the fall and winter), they are often 30–40 cm. (12–16 inches) long. The flower stalks arise from the inside of the sheaths; often two or three are produced in succession by the same plant. The illustration shows a plant with two flowers, of which one is just opening and the other has just fallen, only the stalk and spathe remaining. The staminate and pistillate flowers are much alike, but found on different plants (*dioecious*). The flower before opening is enclosed in a 2-cleft spathe about 2 cm. long. The lobes of this are oblong, more or less toothed on the sides and rounded at the apex. In

fig. 3 they are shown in position; in fig. 6, the spathe is split open on one side and one of the lobes laid open to show the ovary. The floral envelope consists of but one set of leaves, three in number. They are oblong, about 1 cm. (⅖ inch) long, truncate and often slightly toothed at the apex. In the staminate flowers, there are 9 stamens but no trace of a pistil. There are practically no filaments, the linear anthers being sessile or nearly so, slightly shorter than the sepals. The anthers are 4-celled. In opening a bud under water, the writer happened to break an anther-cell, and the pollen floated out in a long string, the pollen-grains being held together in a glutinous matter. Perhaps this is the actual way the pollen is dispersed in this species, the flower always remaining submerged in the water. In the pistillate plant the place of the stamens is taken by 9–12 filiform stigmas. In the specimen figured, they were 12 in number. The ovary, as shown in fig. 6, is inferior, even in the young state covered with protuberances, which in fruit become longer and finger-like. The only fruit that was found in the collection was evidently only half-grown, 1.5 cm. long and 1 cm. thick (⅗ × ⅖ inch). The fruit is incompletely 9–12-celled, the partitions nearly but not quite meeting in the center. The seeds are numerous on parietal placentae.

In the original description, Konig included in *Thalassia,* two other species, *T. ciliata* and *T. ovata.* These, however, have an altogether different fruit, and belong to a different genus, and, according to many botanists, to a different family. They are now known as *Halophila.* This genus is represented by three species in the West Indies and southern Florida, viz., *H. Baillonis, H. Aschersonii* and *H. Engelmanni.* The last of these was described by Prof. Ascherson from sterile material without flowers or fruit, and it was only the general habit that suggested the genus *Halophila* to him. Until recently the flowers of this species were unknown. The pistillate flowers and the fruit were described for the first time in the North American Flora, vol. 17, p. 68, from material recently collected in the Bahamas by Dr. M. A. Howe. The staminate flowers of this species are still unknown as well as those of *H. Aschersonii.* Dr. Howe

collected the latter for the first time in fruit on the coast of Porto Rico. The third species, *H. Baillonis,* was the only one of the American species, of which the flowers and fruit were well known, so made especially by the industrious work of the Danish botanists.

In other words, the recent explorations, carried on by the New York Botanical Garden in the West Indies have added such important facts to the knowledge of these two genera of submersed marine plants, that blossom and fruit wholly under water, that we can say that their life-history is now somewhat known. *Thalassia testudinum* is a very common plant on the coasts of Florida and the West Indies, often mistaken for the eel-grass (*Zostera marina*), and the others are not very rare, but the flowers and fruit have rarely been collected.

P. A. RYDBERG.

EXPLANATION OF THE PLATE.

Thalassia testudinum.

FIG. 1. Staminate plant with 2 peduncles (natural size).

FIG 2. Upper part of leaf of a sterile plant, collected in September (natural size).

FIG. 3. Staminate flower, with one sepal turned down (twice natural size, as are all the following figures).

FIG. 4. Young bud of staminate flower.

FIG. 5. The same laid open.

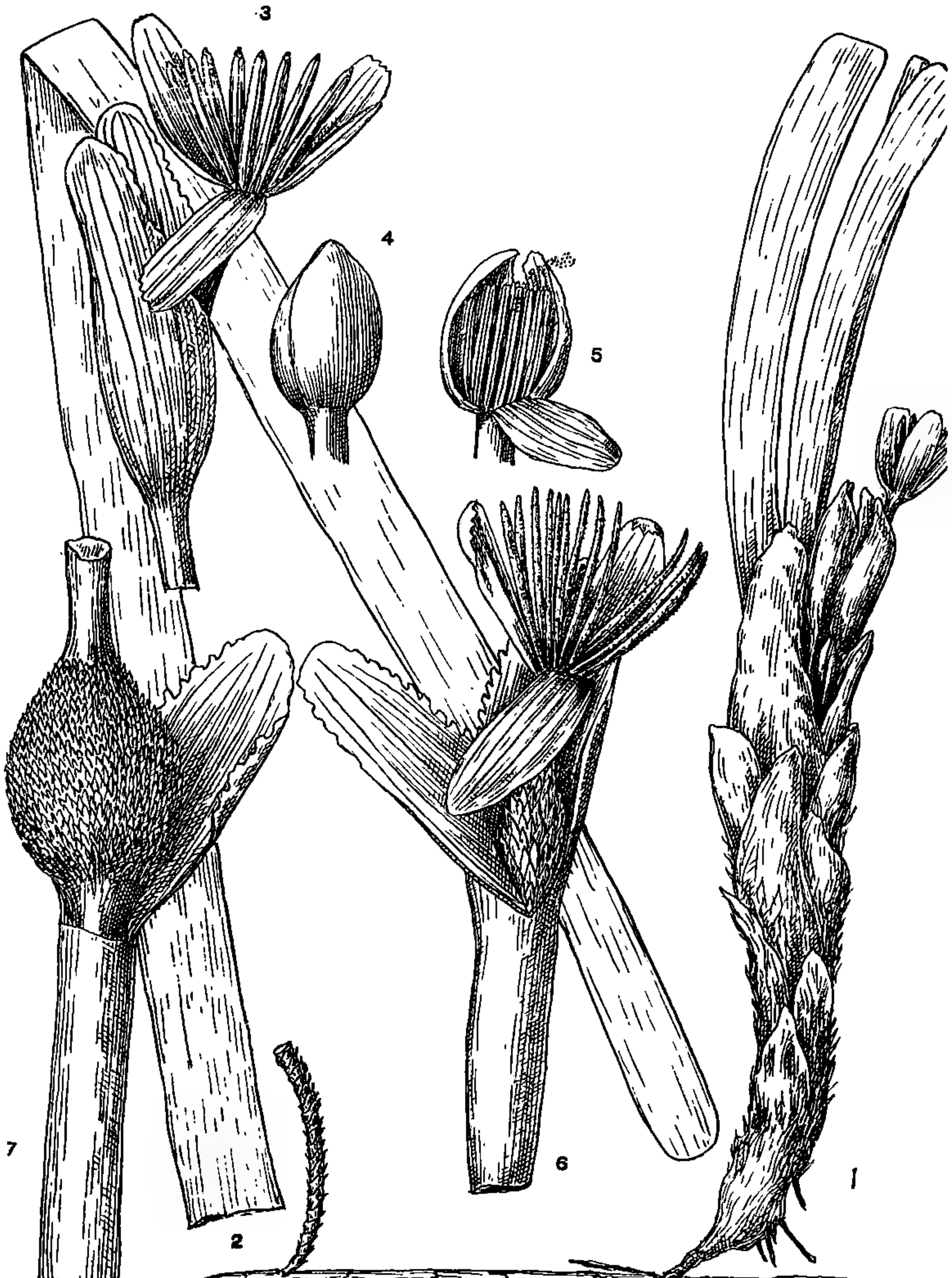
FIG. 6. Pistillate flower; spathe cut open on one side and one lobe turned back to show ovary; one of the sepals turned down to show the 12 stigmas.

FIG. 7. Young fruit; one half of the spathe removed.

CONFERENCE NOTES.

The first regular monthly conference of the scientific staff and students of the New York Botanical Garden for this academic year met in the library on the afternoon of November 3. The following is a synopsis of the programme rendered.

Mr. Fred J. Seaver called attention to *Nectria Papilionacearum* Seaver, a fungus which occurs on leaves of plants belonging to



TURTLE-GRASS.

(*Thalassia testudinum.*)

the pea family. Three specimens of this species were originally found in the herbarium of the Garden under various names. One was collected by Ravenel and two were collected by Dr. Kellerman in Missouri. All were incorrectly named and after a careful examination the species was described as new under the name given above. The description was published in the March number of *Mycologia.* During the summer a fourth specimen of this species was sent in by Prof. Sheldon, of West Virginia, the specimen having been correctly named by him.

The species has been collected up to the present time on leaves of *Lespedeza, Meibomia* and *Rhynchosia* and is always accompanied by another black fungus belonging to the genus *Parodiella,* the black fungus being much more conspicuous than the *Nectria* itself.

Attention was also called to a cup-fungus (*Pezicula carpinea*) which occurs on the bark of ironwood trees. So far as observation has gone, this fungus appears to be present only on living trees and to live as a parasite. A tree which had apparently been killed by the fungus was cut and a specimen preserved for the museum of the Garden.

Specimens of maple leaves infected by a fungus commonly known as tar spot were also shown. This fungus is rather destructive to the maple and since the black spots on the leaves in the fall of the year represent a resting stage of the fungus the disease may be controlled by raking together the leaves in the fall and burning them.

Specimens of the large orange cup-fungus were also shown. This fungus, which is edible, has been collected by Dr. W. A. Murrill two years in succession where it occurs on his lawn. The species is very well characterized by its large orange-colored cups, and has a wide distribution, having been observed from the Atlantic to the Pacific coast. It usually attracts much attention from its bright color.

Dr. W. A. Murrill next exhibited some interesting specimens of the higher fungi. A study of fresh specimens of *Boletus Morrisii* Peck, recently collected in New Jersey, shows that this species has been reported in America by Morgan and others under

the name of *Boletus radicans* Pers., a closely related European species.

A splendid collection of *Boletus subsanguineus* Peck, from New Jersey, was exhibited. This species was described from drawings and notes made by McIlvaine from specimens collected in Pennsylvania, but the types were destroyed, and McIlvaine's published figure represents the plant very poorly.

Two undescribed species of agarics collected during the past season in the vicinity of Bronx Park were shown. Descriptions of these will soon be published.

Specimens of *Scleroderma vulgare* and *Scleroderma verrucosum,* two hard-skinned puffballs, were exhibited from the local collections and the two species briefly discussed. Colored figures made from these specimens in the fresh condition will appear in the January number of *Mycologia.*

The genera of the Chantereleae, a tribe of the Agaricaceae, were briefly discussed and some of the species exhibited. Members of the genus *Dictyolus* occur only on living mosses, while species of *Asterophora* are found parasitic on certain large agarics, such as *Russula* and *Lactaria.* One genus is based on *Cantharellus olivaceus* Schw., a dimidiate brown-spored species occurring on dead logs and roots. Specimens collected by Dr. Murrill in Tennessee agree with those originally collected by Schweinitz in North Carolina. Another genus is based on a tropical plant that is entirely green, with green spores.

The species usually known as *Nyctalis asterophora* was exhibited in two collections made during the past summer, one in New Jersey and one in Chappaqua, New York. In this species the usual method of reproduction by basidiospores seems to be suppressed, while an immense number of specialized, thick-coated conidia, called *chlamydospores,* appear on the surface of the pileus in the form of a brown powder. The production of these chlamydospores and the parasitic habit of the plant make it one of the most interesting species of the family.

In conclusion, Dr. Murrill exhibited and briefly commented upon a large number of excellent photographs of Ohio and Ken-

tucky fungi made by Professor G. D. Smith, of Richmond, Kentucky, for Professor Bruce Fink, of Miami University.

Dr. N. L. Britton, on account of the lateness of the hour, discussed but briefly some of the results of Dr. J. A. Shafer's work in the exploration of the flora of the Cuban keys. From this work it is found that the number of species thought to be endemic to the Bahama Islands is greatly reduced. The following specimens illustrating the extension of the Bahama flora were exhibited: *Acacia coriophylla* Benth., *Badiera oblongata* Britton, *Cestrum bahamense* Britton, *Chiococca pinetorum* Britton, *Cordia bahamensis* Urban, *Cyperus floridanus* Britton, *Galactia spiciformis* T. & G., *Iresine Keyensis* Millsp., *Jacquinia Keyensis* Mez., *Pithecolobium bahamense* Northrop, *Pseudophoenix Sargentii* Wendl. and *Terebinthus inaguensis* Britton.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. Marshall A. Howe delivered an illustrated lecture, October 30, on "The Plant Life of the Sea," in Fullerton Hall, Art Institute, Chicago, in the thirty-first free lecture course of the Field Museum of Natural History.

Dr. and Mrs. Howe sailed on the S. S. "Tagus" for Colon, November 27, intending to devote five or six weeks to the collection and study of the marine algae of the Panama region.

Dr. C. F. Millspaugh, curator of botany at the Field Museum of Natural History, Chicago, spent three weeks during November at the Garden carrying on further studies of the flora of the Bahamas in coöperation with Dr. N. L. Britton.

Mr. W. W. Eggleston returned to the New York Botanical Garden, October 30, after a ten weeks' trip through the Southern States east of the Mississippi. A week was devoted to botanical exploration in South Carolina in the vicinity of the home of Thomas Walter, author of the Flora Caroliniana, published in 1788. Several hours were spent at the Charleston Museum in examining the herbarium of Stephen Elliott. Mr. Elliott had

abundant opportunities to observe the vegetation of the coastal region, and to acquire an accurate knowledge of the coastal plants, which formed the basis of his Sketch of the Botany of South Carolina and Georgia. A day was given to the study of the herbarium of Robert Peter, which is in an excellent state of preservation at the State College, Lexington, Kentucky.

At a meeting of the Board of Managers held October 14, 1909, the director-in-chief was authorized to arrange occasional "Visiting Days" on which members of the corporation will be received at the Garden by members of the staff and escorted through the grounds and buildings, thus providing opportunity for inspection of the collections and of work in progress. Such an occasion was arranged for the afternoon of Thursday, October 21.

The Garden has recently acquired by gift through the courtesy of the Peary Arctic Club from the American Museum of Natural History, a valuable collection of herbarium specimens made on the late expedition of Comm. Robert E. Peary to the North Pole. The specimens were mostly collected by Dr. J. W. Goodsell. While some of the plants were gathered on the northern coast of Labrador, the majority were obtained on Grant Land in the northern portion of Ellesmere Land, an island west of Greenland. One of the packages contains specimens from perhaps the most northern locality where flowering plants have ever been found, while another is from Etah, the most northern habitation of man. Duplicates from this collection will be mounted and exhibited at the American Museum of Natural History in Esquimaux Hall.

Meteorology for October.—The total precipitation for the month was .97 inch. The first fall frost of the season occurred about the middle of the month. Maximum temperatures were recorded of 78° on the 7th, 81.5° on the 9th, 74.5° on the 11th, 61.5° on the 22d and 69° on the 31st. Also minimum temperatures were recorded of 42.5° on the 6th, 33° on the 14th, 27.5° on the 20th and 31° on the 30th. The mean temperature for the month was 56.25°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

52 specimens of fleshy fungi from Chappaqua, New York. (Given by Mrs. C. E. Rider.)

1 specimen of *Boletus scaber* from Hempstead, New York. (By exchange with Dr. R. M. Harper.)

25 specimens of fungi from New York. (Collected by Dr. W. A. Murrill.)

16 specimens of fleshy fungi from New Jersey. (By exchange with Mr. W. H. Ballou.)

3 specimens of mosses from Kentucky. (Collected by Mr. W. W. Eggleston.)

1 specimen of *Linaria Linaria* from Pennsylvania. (Given by Mr. Romyn Hitchcock.)

5 specimens of *Anthoceros Macouni* and *Riccia membranacea* from Connecticut. (Given by Miss Annie Lorenz.)

20 specimens of fungi from Chappaqua, New York. (Given by Mrs. C. E. Rider.)

2 specimens of *Boletus* from Maryland. (Given by Mr. W. R. Maxon.)

9 specimens of fungi from Staten Island, New York. (By exchange with Mr. W. H. Ballou.)

1 photograph of fungus in a mine, Idaho. (Given by Professor J. F. Kemp.)

1 specimen of moss from Staten Island, New York. (Given by Mrs. N. L. Britton.)

242 specimens of mosses from Bolivia. (Given by The Bolivian Rubber Company.)

1 specimen of *Pholiota* from New Jersey. (Given by Mr. O. P. Medsger.)

28 specimens of marine algae from North Carolina and South Carolina. (Given by Dr. W. D. Hoyt.)

3 specimens of mosses from Connecticut. (Given by Miss Annie Lorenz.)

6 specimens of mosses from Cape Breton Island, Nova Scotia. (Given by Mr. George E. Nichols.)

2 specimens of mosses from Florida. (Given by Dr. R. M. Harper.)

1 specimen of moss from Delaware County, New York. (Collected by Mr. Norman Taylor.)

93 specimens of fleshy fungi from Chappaqua, New York. (Given by Mrs. C. E. Rider and Mrs. W. A. Murrill.)

3 specimens of *Dioon spinulosum* from Mexico. (Given by Dr. C. J. Chamberlain.)

64 specimens of flowering plants from Colorado. (By exchange with Mr. George E. Osterhout.)

166 specimens of flowering plants from Canada. (By exchange with Geological Survey of Canada.)

84 specimens of flowering plants from the eastern United States. (Given by Dr. Philip Dowell.)

24 specimens of flowering plants from Pike's Peak, Colorado. (Given by Mrs. M. E. Soth.)

LIBRARY ACCESSIONS FROM SEPTEMBER 1 TO OCTOBER 31, 1909.

Barbados Agricultural Reporter. Vol. 4. Barbados, 1848. (Given by Dr. J. H. Barnhart.)

BELL, NANCY R. E. *Flowering plants.* London, no date. (Given by Dr. J. H. Barnhart.)

BERLESE, AUGUSTO NAPOLEONE & BRESADOLA, GIACOMO. *Micromycetes Tridentini.* Rovereto, 1889.

BOLUS, HARRY. *Icones Orchidearum austro-africanarum extra-tropicarum.* Vol. 1. London, 1893–96.

BRECK, JOSEPH. *The flower-garden.* Boston, 1856. (Given by Dr. J. H. Barnhart.)

BRIDGEMAN, THOMAS. *The young gardener's assistant.* New ed. New York, 1853. (Given by Dr. J. H. Barnhart.)

CALDWELL, OTIS WILLIAM. *Handbook of plant morphology.* New York, 1904. (Given by Dr. J. H. Barnhart.)

CLINTON-BAKER, H. *Illustrations of conifers.* Vol. 2. Hertford, 1909.

COBBETT, WILLIAM. *American gardener.* Baltimore, 1823. (Given by Dr. J. H. Barnhart.)

COOK, ERNEST THOMAS. *Carnations, picotees, and the wild and garden pinks.* London, 1905. (Given by Dr. J. H. Barnhart.)

COOK, ERNEST THOMAS. *Sweet violets and pansies.* New York, no date. (Given by Dr. J. H. Barnhart.)

DEBEAUX, J. ODON. *Contributions à la flore de la Chine.* Paris, 1875–79.

ELEY, JAMES NORMAN. *American florist.* Hartford, 1845. (Given by Dr. J. H. Barnhart.)

EULER-CHELPIN, HANS VON. *Grundlagen und Ergebnisse der Pflanzenchemie.* Teil 2–3. Braunschweig, 1909.

FIGDOR, WILHELM. *Die Erscheinung der Anisophyllie.* Leipzig, 1909.

FULTON, JAMES ALEXANDER. *Peach culture.* New York, 1870. (Given by Dr. J. H. Barnhart.)

GLOAG, M. R. *Book of English gardens.* New York, 1906. (Given by Dr. J. H. Barnhart.)

GOFF, EMMETT STULL. *Principles of plant culture.* Ed. 3. Madison, 1906. (Given by Dr. J. H. Barnhart.)

GREEN, ROLAND. *Treatise on the cultivation of ornamental flowers.* Boston, 1828. (Given by Dr. J. H. Barnhart.)

GREINER, TUISCO. *New onion culture.* New York, 1903. (Given by Dr. J. H. Barnhart.)

HIBBERD, JAMES SHIRLEY. *The fern garden.* Ed. 2. London, 1869. (Given by Dr. J. H. Barnhart.)

JAENNICKE, FRIEDRICH. *Studien über die Gattung Platanus L.* 1892–1897. Halle, 1899.

JENNINGS, SAMUEL. *Orchids: and how to grow them in India and other tropical climates.* London, 1875.

Journal of the United States Agricultural Society for 1855. Boston, 1856. (Given by Dr. J. H. Barnhart.)

KERCHOVE DE DENTERGHEM, OSWALD DE. *Le livre des orchidées.* Gand, 1894.

LOTSY, JOHANNES PAULUS. *Vorträge über botanische Stammesgeschichte.* Band 2. Jena, 1909.

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SEEDS AND PLANTS.

21 plants for nurseries. (Given by Blue Hill Nurseries, J. Huerlin, Proprietor.)

1 plant of *Agave* for conservatories. (Given by Mrs. L. Emmerich.)

3 palms for conservatories. (Given by Mr. F. R. Newbold.)

2 plants for conservatories. (Given by Mrs. W. R. Buck.)

15 plants for conservatories. (By exchange with Mr. F. Weinberg.)

87 plants for hardy collections. (By exchange with Mr. L. S. Livingston.)

3 plants from Kentucky, for hardy collections. (Collected by Mr. W. W. Eggleston.)

3 cacti for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

604 plants for nurseries borders and herbaceous grounds. (Purchased.)

2 packets of seed. (By exchange with Mr. L. S. Livingston.)

1 packet of seed of *Calochortus* sp. (Given by Dr. H. H. Rusby.)

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BRONX PARK, NEW YORK CITY

Vol. X DECEMBER, 1909 No. 120

JOURNAL

OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

OF

The New York Botanical Garden

VOL. X December, 1909. No. 120

COÖPERATION IN THE NATURE-STUDY WORK OF THE PUBLIC SCHOOLS.

The plan of giving lectures and demonstrations to children and teachers of the public schools, in order to aid them in their botanical nature-study work, commenced several years ago and since continued during the spring and autumn months, has always been productive of increased interest in the general work of the Garden. The privilege has naturally been mainly taken advantage of by the schools of the Borough of the Bronx, though some of the Manhattan schools have been at times represented, and it is planned that they will send more children than heretofore next spring.

The schools select a certain number of teachers and children from grades 4 B and 5 B, it being, of course, impossible to send entire classes. They reach the lecture-hall in the museum building at 2 o'clock; the lectures require about half an hour and the children and teachers then proceed in detachments to points in the buildings and in the grounds, where they are met by Garden aids and assistants and the subject of the lecture more fully demonstrated by living plants and actual specimens. The opportunity to lecture to large numbers of children is taken advantage of to impress upon them the necessity for the proper care and protection of street trees and park plantations generally, as well as instructing them in the elementary facts concerning the growth of plants, their uses, their diseases and their classification.

The following report by Principals Stevens and Seelye will be

School.	4 B Lectures.						5 B Lectures.							
	Lecture 1.		Lecture 2.		Total.		Lecture 1.		Lecture 2.		Lecture 3.		Total.	
	Pupils.	Teachers.	Pupils.	Teachers.	Pupils.	Teachers.	Pupils.	Teachers.	Pupils.	Teachers.	Pupils.	Teachers.	Pupils.	Teachers.
1	54	2	28	1	82	3	0	0	0	0	20	1	20	1
2	59	3	73	3	132	6	55	2	48	2	40	2	143	6
3	98	4	96	4	194	8	81	3	45	3	56	2	182	8
4	67	2	43	2	110	4	67	2	35	1	0	0	102	3
5	37	1	41	1	78	2	63	2	58	2	58	2	179	6
6	82	2	78	2	160	4	73	0	71	0	71	0	215	0
8	45	1	46	1	91	2	75	2	75	2	80	2	230	6
9	0	0	0	0	0	0	46	1	0	0	0	0	46	1
10	125	5	64	3	189	8	89	5	63	2	49	4	201	11
12	17	1	13	1	30	2	23	1	23	1	27	1	73	3
13 & 41	75	3	72	3	147	6	85	3	78	3	76	3	239	9
14	34	1	25	1	59	2	34	1	27	1	24	1	85	3
15	29	1	21	1	50	2	23	1	17	1	18	1	58	3
16	0	0	0	0	0	0	31	1	0	0	0	0	31	1
18	42	1	22	1	64	2	19	1	12	1	10	1	41	3
19	0	0	23	1	23	1	0	0	0	0	0	0	0	0
20	0	0	71	2	71	2	66	2	40	2	0	0	106	4
23	68	2	46	2	114	4	63	2	49	2	57	2	169	6
25	78	2	54	2	132	4	56	2	48	2	47	2	151	6
26	0	0	0	0	0	0	23	1	23	1	0	0	46	2
27	125	5	108	5	233	10	149	5	119	6	104	5	372	16
28	45	2	60	2	105	4	35	2	55	2	0	0	90	4
29	39	1	37	1	76	2	42	1	40	1	36	1	118	3
30	120	3	84	3	204	6	56	2	51	2	48	2	155	6
31	34	1	25	1	59	2	43	1	31	1	34	1	108	3
32	122	3	129	3	251	6	82	3	94	3	77	3	253	9
33	43	2	40	2	83	4	34	1	30	1	0	0	64	2
34	94	2	74	3	168	5	65	2	56	2	46	2	167	6
35	16	1	16	1	32	2	36	2	26	2	0	0	62	4
36	32	1	25	1	57	2	16	1	18	1	11	1	45	3
37	81	3	70	2	151	5	79	2	41	2	36	2	156	6
38	63	2	37	1	100	3	75	2	64	2	55	2	194	6
39	0	0	87	2	87	2	56	1	46	2	47	1	149	4
40	0	0	89	3	89	3	95	2	51	1	45	1	191	4
42	46	2	46	2	92	4	52	2	68	2	32	2	152	6
43	26	1	66	2	92	3	76	3	51	2	70	2	197	7
Total Fall Lectures.....					3,605	125							4,790	171
Total Spring Lectures.....					3,668	110							4,832	170
Total Year, 1909.....					7,273	235							9,622	341
Grand Total for Year, both Grades.....													16,895	576

of interest as showing the attendance by schools of the Bronx and the total number for the year.

PUBLIC SCHOOL 6, THE BRONX.
December 1, 1909.

To JOHN W. DAVIS,
Superintendent Districts 23 and 24, and
JOSEPH S. TAYLOR,
Superintendent Districts 25 and 26.

Gentlemen : The fifteen lectures to the children of the 4 B and 5 B grades of your districts, given at the New York Botanical Garden by Dr. Britton and his staff, were given precisely according to the schedule submitted to you in October, no postponements being necessary on account of bad weather. As the lectures were conducted in the same manner as during the Spring term, we omit details and submit merely the figures of the attendance.

Respectfully,
P. STEVENS, JR.,
BURT P. SEELYE,
Directors.

THE KAFIR-BREAD PLANTS.

In far-off southern Africa, in the land of the Kafir and the Zulu, is found a group of plants, belonging to the cycas family, known to the botanist as *Encephalartos*, a name derived from the Greek and meaning "bread within the head," alluding to the farinaceous pith within the stem of these plants which is used as a food by the natives of that region. They are said to bury the stems in the ground and allow them to remain there for several months ; the mucilaginous center is then taken out and dried, and made into cakes like bread. On account of this use of it for food the name of " Kafir-bread " has been bestowed upon the plants, and especially upon that species known as *Encephalartos Caffer.* The name " Kafir," meaning an unbeliever, was applied by the Mohammedans of eastern Africa to the negroes of that region because of their refusal to accept the faith of Mohammed. Besides the living species, one fossil species is known.

The Kafir-bread plants, about twelve species, are found only in Africa, mainly in the southern parts, with one or two species extending into the tropical portions. They finally develop a long stout cylindric stem, sometimes six to ten feet tall, though

in a young state this is in the form of a hemispheric body, a condition in which they are usually found in cultivation, for they are of very slow growth and require years to attain any size. From the apex of the stem arises a crown of pinnate leaves, in some species forming objects of great beauty and decorative value. The plants are dioecious, that is, they bear the staminate and pistillate cones on different individuals. The former are usually cylindric and narrower than the ovoid pistillate cones.

As stated in the October number of this JOURNAL, the Garden collection of the Cycadaceae, or cycas family, is now located at the new conservatories known as range no. 2, on the eastern side of the grounds. There are three species of the Kafir-bread plants in this collection. One of these, a native of tropical Africa, is shown in two specimens, a large and a small one, and is called the armored encephalartos or Kafir-bread, from the aggressive character of its spiny leaves; on account of these it is known to botanists as *Encephalartos horridus*. The leaves of the larger plant are from four to five feet long and ten to twelve inches wide, and of a gray-green; they are stiff and uncompromising. The leaflets are five to six inches long, very thick and firm, lanceolate in outline, and with one or two large lobes or teeth on the lower side, these teeth sometimes being two and a half inches long and giving to the leaflet a bifid appearance. The lobes or teeth are spreading and more or less turned from the plane of the leaflet, thus forming an effective armor which serves well to protect the plant from injury. This plant is now making a cone for the first time; it is pistillate, and is shown in the accompanying illustration. Ovoid in shape and gray-green in color, it is thirteen inches long and seven and a half inches in diameter, with an obtuse apex. This interesting plant will be found at the eastern end of the central bed, on the south side.

On the opposite side of the same bed is a large plant of *Encephalartos villosus*, a native of southern Africa, which is known as the golden-fruited Kafir-bread, from the apricot color of its pistillate cone. This plant bore a pistillate cone some time ago. The species is quite in contrast with the one just described. The leaves are flexible, and long and elegant, with the apex

drooping, giving the plant a graceful appearance and making it an object of decorative value. The leaves are a deep rich green, from five to seven feet long and about two feet broad. The leaflets are somewhat curved, lanceolate, about one foot long and not over three fourths of an inch wide; when young they have a few spines on the margin, but as the leaves grow older these often become almost obsolete, so that the plant may be approached and examined without fear of injury. The leaf-stalks or petioles are densely covered with a woolly matting, giving the base of the crown a fuzzy appearance; it is from this character that the specific name is derived.

The third species is represented by a relatively small plant which is located on the north side of the house. It was secured some years ago by exchange with the Royal Gardens, Kew, England. At that time it was a small plant, but has recently started to grow and is just forming a crown of large leaves five to seven feet long. These have the stalks or petioles woolly, as in the species previously described, but this character is not so pronounced here. In both this and the preceding species the leaf-stalks or petioles are armed with stout spines which pass into the leaflets above, in *Encephalartos villosus* rather abruptly, in the other gradually. The leaflets are somewhat curved, up to eight inches long and one and a quarter inches wide, with four to eight teeth on each margin. Judging from the character of the leaves alone, this plant seems to belong to *Encephalartos Hildebrandtii*, another species of tropical Africa.

Besides the species already enumerated as forming part of the collection, the Garden desires to secure, either by gift or exchange, any of the species not represented. Some of these are: *Encephalartos Altensteinii*; *E. Caffer*, the species of especial economic value to the natives inhabiting southern Africa; *E. cycadifolius*, also known under the name of *E. Friderici-Guilielmi*; *E. Ghellinckii*; *E. lanuginosus*; *E. Lehmanni*; and *E. elongatus*; all from southern Africa.

GEORGE V. NASH.

CONFERENCE NOTES.

The regular monthly conference of the scientific staff and students of the Garden met in the library on Wednesday, December 1, and was presided over by Dr. W. A. Murrill. Mr. E. D. Clark, the first speaker of the afternoon gave a paper on the subject of "The Relation of Organic Matter to Soil Fertility." The following synopsis was prepared by Mr. Clark :

From Liebig's time nearly to the present, the necessity for crop rotation was explained by the great chemist's theory of the mineral requirements of the soil. According to this theory it is the depletion of these mineral substances or the change of their relationship by the growing plant that lowers the fertility of the soil for that plant, making necessary the change of crop or the addition of commercial fertilizer to stop or repair the loss caused by that sort of plant. However, recent work, especially that of Schreiner and collaborators, seems to show that the mineral constituents of soils are by no means the sole factor in questions of fertility. This work indicates that plants, during life or by decomposition after death, give to the soil certain organic substances which may make that soil more or less toxic to the plant which gave rise to them. In fact, definite crystalline organic compounds have been isolated from soils known to be poor for certain crops. Schreiner considers it likely that the oxidizing powers of the plant roots and free access of atmospheric oxygen through tillage, normally result in the oxidation of such harmful substances to others less injurious to the crop. Bolley has reported an experiment upon the effect of steaming a worn-out wheat soil which showed that such treatment rendered this soil capable of producing a good yield of wheat in the two following years.

It was with these ideas in mind that we became interested in the fungus *Pyronema omphalodes* which occurs only on recently burned places as noted by Seaver and also Kosaroff. Both report that it can be cultivated very easily in the laboratory upon soil that has been heated to the temperature of boiling water or above, while they were unable to grow it upon an unheated soil.

This would lead one to think that in *Pyronema* we have an organism that is very sensitive to the changes soils experience when heated. Kosaroff found that he could make a water extract of unheated soil, which extract was unfavorable to *Pyronema*, while such an extract of a heated soil seemed to remove from the heated soil those substances which encouraged *Pyronema* growth. Thus, heating a soil seems to result either in producing substances favorable to *Pyronema* or in causing the destruction of those which are unfavorable; possibly by oxidation processes brought about by the high temperature. We intend to investigate the soil changes produced by heat as indicated by the growth of *Pyronema* and hope to apply some of our observations to the higher plants. The questions of the relationship of *Pyronema* itself to the heating of soil are of no great practical importance but the sensitiveness of this fungus to soil changes arising in this way, makes *Pyronema* useful as an indicator of such changes and we hope to use it for this purpose in our work.

Mr. Nash exhibited specimens of a grass unlike other grasses in general appearence. He called attention to a paper published by Dr. George Engelmann many years ago in which he described two new dioecious grasses, one of them the buffalo-grass, *Buchloë*, now known as *Bulbilis*, and the other the grass here under consideration, *Monanthochloë littoralis*. The spikelets of this grass might be easily overlooked, as they are nearly concealed in the leaves of the short branches. The pistillate spikelets are sometimes quite evident from the protrusion of the long styles of the flowers. The leaves of the branches merge right into the scales of the spikelets, the first one of which, were it not for the presence sometimes of a palet, might be mistaken for a leaf.

The grass is found on or near the seacoast. Its distribution is interesting. It is found on the Florida keys, from Elliott Key, at about 25° 30′ north latitude, its farthest north on the east coast, to Marquesas Key, to the west of Key West. Its next appearance is at Pine Island, on the west coast of Florida, at a little over 26° lat., its most northerly point on the east coast of the United States as indicated by herbarium material. There seems to be no record of its occurrence along the entire Gulf

coast until Galveston, Texas, is reached, at about 29° lat. Herbarium specimens show that it also occurs at Corpus Christi to the south, and at Matamoras, at the mouth of the Rio Grande, from which locality it was supposed to have been collected by Berlandier, whose material was part of that examined by Engelmann. It is then lost sight of until we reach Silam, Yucatan, where it again occurs. Its next appearance, so far as herbarium material we have examined shows, is on the coast of Lower California. Here it is found at La Paz and at Magdalena Bay. It again enters territory of the United States at San Diego and Long Beach, California, the latter being its farthest north, so far as known, with nearly 34° lat. Its distribution would seem to indicate one controlled by temperature, with a more northern extension on the west coast than on the east, as might be expected.

It was the recent discovery of this grass on Cayo Cruz, lying to the north of Cuba, by Dr. Shafer, which made it of especial interest at the present time. Its detection there not only brought this grass into the flora of Cuba, but added it to the known flora of the West Indies. Mr. Hitchcock was evidently not aware of its occurrence in Cuba, as he makes no mention of it in his recent paper on the grasses of that island.

Mr. Richard C. Schneider spoke on the distribution of *Actinophyllum* in the West Indies. This genus of Araliaceae is here represented by only three species, two of which are endemic in the mountains of Jamaica, while the third species is found in Martinique.

Mrs. Britton read a letter dated November 23 from William Harris, superintendent of Public Gardens and Plantations of Jamaica, giving an account of the recent floods and destruction of roads and bridges and washing away of the coffee plantations in the Blue Mountains. A letter from Dr. Forrest Shreve, written at Cinchona, the Tropical Laboratory of the New York Botanical Garden, states that between November 5 and 11 the total amount of precipitation amounted to 79.09 inches (nine months' rain in a week) with many landslides, destruction of coffee fields and works and some loss of life of men and mules.

Dr. Britton reported further on the results of Dr. J. A. Shafer's

recent exploration of the Cuban Keys, stating that the collections contain still more characteristic species of the Bahamian archipelago, among them *Tricera bahamensis* (Baker) Britton and *Callicarpa Hitchcockii* Millsp. F. J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. W. A. Murrill, assistant director, sailed for southern Mexico December 2, to continue his studies of tropical fungi. He was accompanied by Mrs. Murrill.

Dr. A. W. Evans, professor of botany in Yale University, spent December 5 at the Garden consulting the collection of Hepaticae.

Dr. Hans Hallier, conservator of the Royal Herbarium at Leyden, was a visitor at the Garden during the early part of December.

Mr. Reginald Heber Howe, Jr., has been granted a research scholarship in the Garden for one month, beginning December 20, to aid him in his studies of American lichens.

Mr. W. W. Eggleston has been granted a research scholarship for two months to aid him in continuing his work upon the apple and plum families.

One of the chocolate trees, *Theobroma Cacao*, now has a fruit on it which is nearly mature. The plant is located in the northern corner of house no. 4 of conservatory range no. 1. It is from the seeds contained in the pod, as it is called, that chocolate and cocoa are made. In the orchid house, no. 15, of the same range, will be found plants of the holy ghost or dove flower in bloom. This is *Peristeria elata*, a native of Panama.

Cases nos. 6 and 7 in the museum of fossil plants have been recently rearranged and new specimens placed on display, with the special object of illustrating the fossil flora of the vicinity of New York. The specimens all belong to the middle Cretaceous period. Those from New Jersey are included in Amboy clay and the Cliffwood clay marl series of deposits. Those from Staten Island, Long Island, Block Island and Martha's Vineyard are

referred to the Island Series. All but a few of the specimens on display have been figured and described in Monographs of the United States Geological Survey, volume 26 (The Flora of the Amboy Clays), and volume 50 (The Cretaceous Flora of Southern New York and New England). Type specimens are designated by red stars and other specimens which have been illustrated by blue triangles.

Meteorology for November, 1909. — The total precipitation recorded for the month was .41 inch. Maximum temperatures were recorded of 66.5° on the 2d, 65° on the 21st, and 63° on the 23d. Also minimum temperatures were recorded of 31.5° on the 7th, 25° on the 19th, 27° on the 28th, and 23.5° on the 30th. The mean temperature for the month was 45°.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

15 specimens of ferns from Idaho. (Given by Professor J. F. Kemp.)

13 specimens of palm fruits from Hawaii. (Given by Mr. Whitman.)

9 water-colored drawings of Cuban plants by Mrs. D. O. Oak. (Given by Mrs. N. L. Britton.)

20 specimens of fleshy fungi from Chappaqua, New York. (Given by Mrs. C. E. Rider.)

65 specimens of flowering plants from southern Pennsylvania. (Given by Mr. J. J. Carter.)

214 specimens of flowering plants from Canada. (By exchange with the Geological Survey of Canada.)

1 specimen of *Hypomyces lateritius*. (By exchange with the University of Upsala, Sweden.)

4 photographs of type specimens of *Cyathaea* from Jamaica. (By exchange with the United States National Museum.)

25 specimens of fleshy fungi from Staten Island, New York. (Given by Mr. W. H. Ballou.)

250 specimens of mosses from Canada. (Distributed by Mr. John Macoun.)

6 specimens of hepatics from Waterville, New Hampshire. (Given by Miss Annie Lorenz.)

21 specimens of flowering plants from the northeastern United States. (Given by Mr. E. P. Bicknell.)

1,100 specimens from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

57 specimens of pine, cedar and elm. (By exchange with the American Museum of Natural History.)

3 specimens of fungi from New York. (Given by Mr. E. B. Southwick.)

2 specimens of *Coriolus pubescens* from Ithaca, New York. (By exchange with Professor George F. Atkinson.)

157 specimens of flowering plants from Utah. (By exchange with Professor A. O. Garrett.)

145 specimens of flowering plants from British Columbia and Yukon. (By exchange with the Geological Survey of Canada.)

PLANTS AND SEEDS.

55 plants from Cuba for conservatories. (Collected by Dr. J. A. Shafer.)

5 plants of *Calathea* for conservatories. (By exchange with Mr. A. J. Manda.)

2 plants of *Agave americana* for conservatories. (Given by Mrs. E. Van Rensselaer Ketchum.)

1 plant of *Cereus* for conservatories. (Given by Mrs. O. C. Stillwell.)

1 plant of *Cereus* for conservatories. (Given by Mrs. H. L. Britton.)

10 bulbs of *Kaempferia* from Transvaal for conservatories. (By exchange with the Dept. of Agriculture of Transvaal.)

5 plants of *Opuntia* from Washington for conservatories and nursery. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

8 plants from Santo Domingo for conservatories. (Collected by Mr. Norman Taylor.)

43 plants of *Tillandsia* for conservatories. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

1 plant of *Cyclamen persicum* for conservatories. (By exchange with Mr. Frank Wenisch.)

1 plant of *Cyperus Papyrus* for conservatories. (By exchange with the N. Y. Zoölogical Park.)

1 plant of *Hura crepitans* for conservatories. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

1 plant of *Hechtia* for conservatories. (By exchange with Mr. Light.)

1 plant of *Polygonum compactum* for nursery. (Given by Mr. F. Nooton Biggs.)

596 plants for nurseries, west border and herbaceous grounds. (Purchased.)

3 packets of palm seed from Hawaii for conservatories. (Given by Mr. Whitman.)

1 packet of seed of *Fevillea* from Panama for conservatories. (Given by Dr. H. H. Rusby.)

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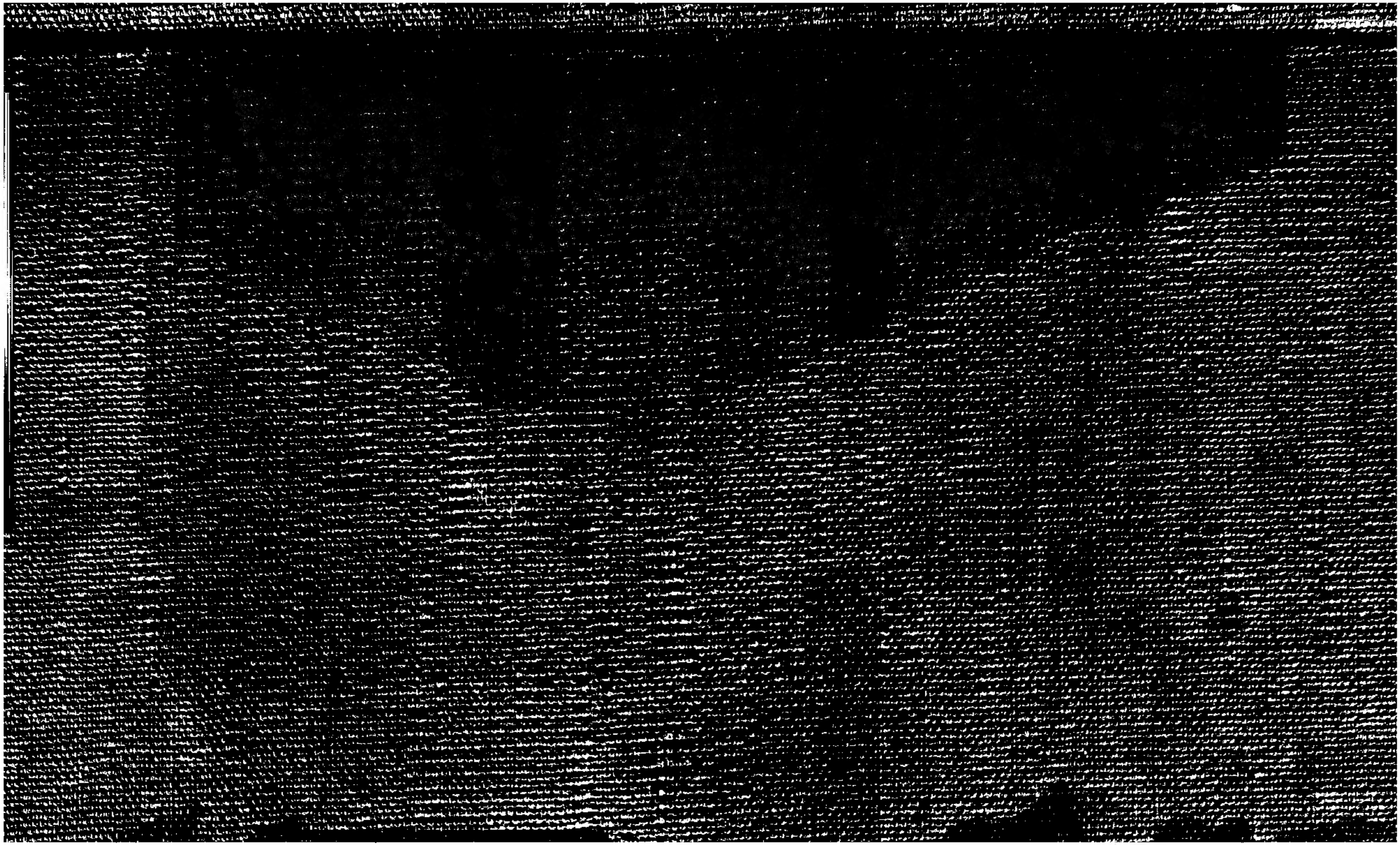
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